LEETON
SHIRE COUNCIL

DRAFT

BUILDING IN THE VICINITY OF SEWER & TRUNK WATER MAINS GUIDELINES

AUGUST 2022

DOCUMENT CONTROL

RESPONSIBLE OFFICER:	Manager Water and Waste Water
REVIEWED BY:	Senior Management Team
LINK TO CSP/DELIVERY PROGRAM/OPERATIONAL PLAN:	FOCUS AREA 4: A quality environment – 3 – Provide sewerage systems and services in uban areas – Operate and maintain sewage treatment and effluent discharge plants and reticulation services at Leeton, Yanco and Whitton
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1	2017	New Policy			

REVIEW OF THIS POLICY

This document will be reviewed every 4 years or as required in the event of legislative changes or operational requirements.

Any major amendments to the document must be made by way of a Council Resolution. Minor amendments such as corrections to spelling, changes to wording for improved clarity, formatting and updates to the Appendixes may be made without approval from the Council.

CONTENTS

1. Purpose

The purpose of Leeton Shire Council's Building in the Vicinity of Sewer and Trunk Water Mains Policy is to:

- protect existing and future assets, both privately and corporately owned, from potential damage caused by improper construction of civil structures.
- formalise the requirements of developers and/or Leeton Shire Council allowing access for repairs, upgrades and inspection of Leeton Shire Council assets and who is subject to the associated costs.

2. Scope

This policy applies to any development that is built in the vicinity of Leeton Shire Council water and sewer assets. Descriptions of such developments are located in section 7.6.

3. Roles and Responsibilities

John Pearson – Manager Water and Wastewater
Ryan Sharman – Water & Wastewater Engineer

4. Definitions

CCTV – Closed Caption Television
WSAA – Water Services Association of Australia
ZOI – Zone of Influence
BCA – Building Code of Australia
Council – Leeton Shire Council

5. Legislation and Supporting Documents

Building in the Vicinity of Sewer and Trunk Water Mains Guidelines, 2019 – Water Directorate Australia
WSA02 – Gravity Sewer Code of Australia

6. Building in the Vicinity of Sewer Mains

6.1 Consideration of build over sewer requests

Any application to Leeton Shire Council to build adjacent/over sewer mains will only be considered if the alternative options outlined below are found to be not viable.

Leeton Shire Council's approach to 'Build in the Vicinity of Sewer' requests is as follows:

- Relocate proposed structure
- Relocate Utility's affected assets
- Provide protection measures and build over/adjacent to asset

It is the developer's responsibility to investigate and document the above options, in consultation with Leeton Shire Council. Some guidance regarding the above options is provided below.

6.1.1 Relocation of proposed building

In all instances the first option considered should be the relocation of the proposed building away from the existing sewer assets.

If this is not feasible due the position of the sewer main on the property adversely restricting the use of the land relocation of assets may be considered.

6.1.2 Relocation of assets

Leeton Shire Council will only consider relocation of existing sewer assets if the applicant can demonstrate that building away from the sewer adversely restricts the use of the land. Any relocation works need to ensure all required design standards (cover, grade, position) are still met and that the capacity or functionality of the assets is not reduced. All costs associated with the relocation of assets are to be funded by the Developer/Applicant.

Relocation - gravity mains (≤ 150mm Diameter)

Where approval to relocate a sewer is granted, the Developer/Applicant will be required to submit plans in accordance with Leeton Shire Council design guidelines. Relocating the sewer following approval is required before construction of the proposed building/structure can commence. The applicant will need to liaise with Leeton Shire Council regarding the bypassing of live sewage flows.

Relocation - rising mains

The relocation of sewer rising mains will not be permitted.

Relocation - easements

The Developer/Applicant may be required to acquire/provide an easement in accordance with Leeton Shire Council requirements over a relocated gravity.

6.1.3 Building over sewer

Leeton Shire Council will only consider a building/structure over the sewer main in exceptional circumstances and then only if the applicant can demonstrate that relocating the building/structure and/or relocation of the sewer is not feasible.

The Developer/Applicant shall consider an integrated approach and demonstrate that all associated risks can be managed with marginal costs if building over a sewer main is to be considered and accepted by Leeton Shire Council. All costs associated with the works are to be funded by the Developer/Applicant.

CCTV inspection

Any application to build over a sewer must include the following:

- A CCTV inspection of the subject sewer, prior to and following construction must be undertaken by a contractor qualified and with the necessary experience to do so, or by Leeton Shire Council at the applicant's expense.
- The results of the CCTV inspection are to be submitted to Leeton Shire Council with the application. The inspection may be used as a dilapidation survey, with the developer required to fully fund any repair work required to rectify damage caused by their development.

Results of the CCTV inspection

Depending on the results of the CCTV inspection, Leeton Shire Council may require the Developer/Applicant to:

- Reconstruct the sewer main in its existing location using construction materials as specified by Council and in accordance with requirements set down within Council's Engineering Guidelines for Subdivision and Development and approved plans, or
- Reline the existing sewer main by the engagement of contractors qualified to undertake such work. The name of contractor and the relining technique to be utilised will be submitted to Leeton Shire Council for approval prior to work commencing.
- All works on gravity sewer mains must be completed for the full extent between manholes.

Stormwater flow paths
Typically, existing sewers are located along overland drainage paths. If new buildings are proposed over existing sewers, then the major overland flow path for the site and catchment should be considered to minimise the risk of flooding to existing and future properties.

An integrated approach of water, sewer and irrigation and drainage assets needs to be considered simultaneously.

6.2 Where the policy applies

This building in vicinity of sewer mains policy applies to the following three structure types:

- Heavy or permanent structures
- Lightweight or semi-permanent structures
- Miscellaneous structures (rainwater tanks, driveways etc.)
- High rise development

This policy applies to any development such as the above that is built in the vicinity of LWU assets.

6.3 Category of structure

6.3.1 Category 1 - Heavy or permanent structures

These structures are typically constructed from masonry, brick, steel, timber and concrete and it is neither reasonable nor practical to remove or dismantle the structure for the purpose of carrying out sewer repairs or refurbishment.

Examples of structures in this category include:

- Houses
- Factories
- Warehouses
- Brick garages / workshops
- Structures that are permanently habitable or used as a work place
- In-ground swimming pools

If Category 1 structures are to be built in the vicinity of sewers, the requirements for protection of and access to the existing sewerage network in the following sections must be followed.

6.3.2 Category 2 - Lightweight or semi-permanent structures

These structures are typically of a type of construction that would make it reasonable to remove/dismantle and re-erect if access to the main, by excavation, was required.

Examples of structures in this category include:

- Pergolas
- Garden sheds
- Above-ground pools (restrictions apply)
- Carports
- Timber / fibro / aluminium garages
- Glass houses / ferneries
- Barbecue facilities

These structures must be readily removable in the case of work required to take place on Leeton Shire Council's assets. Asset protection measures as outlined in Section 7.5 may still apply to certain structures within this category.
Any future costs arising from the requirement to remove and subsequently reassemble these structures, as directed by Leeton Shire Council, will be at the full cost of the owner.

6.3.3 Category 3 – Miscellaneous

Structures in this category do not normally require protection of the sewer mains. Structures in this category include:

- Fences
- Driveways (concrete, asphalt, pavers etc)
- Tarmac areas

As long as minimum depth requirements for sewer main have been met, no special protection measures for the sewer main should be required. However, if uncertainty exists in cases of anticipated high loadings or where sewer mains are less than minimum depth advice shall be sought from Leeton Shire Council.

Any special conditions applied to Category 3 structures would be on a case-by-case basis and would include in part a stipulation that any removal and reinstatement of the structures (involved with Council accessing the sewer main) would be at the cost of the owner.

Provisions required for access to the existing sewerage network still apply.

Note that swimming pools are discussed in Section 7.9 and retaining walls are discussed in Section 7.10.

6.3.4 Category 4 – High rise development

The impact of redevelopment with typically high rise buildings with basement car parks on Council's sewerage infrastructure presents numerous design, construction and operational issues in the protection of Council interests.

Section 7.13 identifies the issues and how they are to be addressed through the assessment, design, construction and operational phases to ensure Council's interests are satisfied.

6.4 Construction not permitted

Structures will not be permitted to be built over and/or in close proximity to the following:

- Sewer rising mains, surcharge mains and critical gravity mains (generally all sewer mains of greater diameter than 300mm mains and/or deemed to be excessively deep ie. greater than 3.0m), as determined by Leeton Shire Council.
- Any gravity sewer that, in the opinion of Leeton Shire Council, is in a poor condition. Exposing of the sewer, and/or CCTV may be required prior to construction. This inspection may determine that repair/replacement may be required. Any subsequent repair/replacement work will be at the developers cost.
- Sewer manholes, lampholes, maintenance points and junctions where sufficient clearances cannot be achieved (see Section 7.7).
- No building within Leeton Shire Council easements.

6.5 Asset protection measures

Where construction of any Category 1 or 2 structures will impose a load within an existing sewer assets zone of influence (see Section 7.6), Leeton Shire Council may request the developer to carry out any combination of the following protection measures:

- Concrete encasement
- Piering of foundations

The protection measures may also be required due to other factors affecting the asset such as available cover.

6.5.1 Concrete encasement

Concrete encasement of the sewer main may be requested for the protection sewer mains due to additional loads imposed by the works. Concrete encasement may also be requested if Leeton Shire Council's minimum cover requirements cannot be met.

Any concrete encasement is to comply with the WSAA Standard Drawing (SEW 1205) and the following specification:

- Only rubber ring jointed vitrified clay and PVC pipes may be encased in concrete. Permission may also be given to replace other types of pipes with PVC pipes prior to encasement depending upon the location and criticality of the lines.
- In trenches of material other than rock, encasing is to extend 150mm under, on both sides and on top of the pipe barrel. For trenches in rock, encasing is to extend 100mm under the pipe barrel, 150mm on top of the pipe barrel and for the full width of the excavated trench.
- Unless otherwise specified, all flexible pipe joints are to be maintained. The minimum length of the encasement will be the total length of the sewer that is affected plus a minimum of
- 1000mm on each side plus any additional length to ensure encasement starts and finishes at a flexible joint. (Subject to soil conditions and depth of sewer this length may increase).
- If a manhole is less than 2 metres from the end of encasement, as required above, the encasement is to be extended up to the second flexible joint from that manhole.
- Backfilling of the trench with suitable material as per specification must not commence until at least 48 hours after placing the concrete.
- Concrete encasement shall not be poured integral with any other foundation or structure.
- Concrete should be minimum class N20 or N25 where a reinforced concrete design is required.
- Sewer junctions that are permitted to be incorporated in proposed concrete encasement are to be upgraded to a rubber ring jointed junction in order to maintain flexibility at the junction branch.
- Where the encasing of sewers in adjoining properties is required, **written approval** from the adjoining owner to enter the property to carry out the works will be required prior to approval being granted for works to commence.

Example drawings for concrete encasement around sewer mains can be found in Appendix 2, Figures 4 and 5.

All costs associated with concrete encasements are to be borne by the developer. Leeton Shire Council works inspectors must be present when encasement work is being carried out.

6.5.2 Piering of foundations

Piering of the proposed structures foundations may be requested to transfer loads outside an assets zone of influence. A certified design prepared by a suitably qualified and experienced Engineer will be required to accompany foundation designs. The plan shall show the design of all footings, beams and piers and clearly note required clearances, ground levels and nominated soil classifications,

The following requirements apply to foundation piering:

- The building and its foundations are to be designed in such a way that no building loads are transmitted to the utility's sewer and where possible, the pipe can be repaired or replaced at any time without affecting the stability of the building.
- Foundations within an assets zone of influence will require piering to a minimum depth of 150mm below the zone of influence of the affected asset or until solid rock is encountered.

- A minimum horizontal clearance of 1 metre is required between any piers and the face of a sewer main.
- The use of displacement and screw pile construction methods will require approval by Leeton Shire Council and may require additional clearances to existing assets as directed.

6.6 Zone of influence

The 'zone of influence' is an area extending both horizontally and longitudinally along the alignment of an underground asset. This area is considered as that part of the ground where:

- Settlement or disturbance of the ground surrounding the pipe may cause damage to buildings or structures on the surface above.
- Loads from buildings or structures on the surface may have an impact on the buried pipe.

The zone of influence shall be determined by extending a line at an angle of 2 (Horizontal): 1 (Vertical) to the surface, starting from a point 150mm below the invert of the sewer main and half of the trench width measured horizontally from the pipes centerline (Figures provided in Appendix 2, Figures 2 and 3).

It is at Leeton Shire Council's discretion whether to consider a steeper angle of repose (max 1H:1V) for stiff soils (clays etc). Geotechnical investigations and a report from a suitably qualified and experienced Geotechnical Engineer need to be provided by the applicant to support such requests.

6.7 Clearances from access structures

Any proposed structure shall not prevent future access to existing maintenance structures associated with sewerage assets. These include manholes, lampholes/maintenance shafts and sewer dead ends.

A minimum horizontal clearance of 1.5m is required around existing access structures as well as a minimum vertical clearance of 3m. The horizontal setback shall increase to 2m if two or more sides of an access structure are built around. The fourth side must be open and accessible at all times.

6.8 Existing encumbrances

Where structures have been built over an underground pipeline without Council approval then Council may require that the structure be demolished, moved or substantially modified so that it complies with this policy.

Where it is necessary to access an underground line for maintenance or repair work Council will not be held liable for the cost of restoring any illegal structures and the property owner may be charged for extra work required due to the illegal structure.

Where a structure has been given permission previously by Council to be built over a pipeline, then no further extensions, additions or reconstructions will be allowed without further assessment. Council recognises that the existing structure presents a risk to both the building and Council's liability. Therefore Council will assess each structure on its own merit to give permission for additions.

6.9 Swimming pools

6.9.1 Above-ground swimming pool

Above-ground pools without floor decking around the pool, and not constructed of concrete or fibreglass, are considered to be semi-permanent structures that are able to be removed on request to enable access to the sewer.

Special sewer protection provisions are not required for these pools provided that they are placed on the existing natural ground levels and **minimum cover requirements to the sewer**

are met. Clearances to sewer access structures described above still apply. The owner should be advised that all costs associated with removal and reinstatement of the pool for access to the sewer main will be at the owner's cost.
Above-ground pools with permanent decking are considered to be permanent structures and are subject to the conditions outlined in Section 7.9.2.

6.9.2 In-ground swimming pool

In-ground fibreglass pool
The following requirements apply to fibreglass pools:

- A minimum horizontal clearance from the pool to the face of sewer pipe of 1.5m is required.
- If a fibreglass pool is constructed within the zone of influence of a sewer main it should be designed and certified as being self-supporting with foundations founded below the zone of influence.
- No pool shall be located closer than 1.5m to any sewer maintenance structure (manholes etc).

In-ground concrete pool
The following requirements apply to concrete pools:

- Minimum horizontal clearance from the pool to the face of sewer pipe of 1m.
- If the concrete pool is within the zone of influence of a sewer main, then the foundations of the pool shall be founded below the zone of influence (e.g. piers) to ensure the pool is self-supporting.
- No pool shall be located closer than 1.5m to a sewer maintenance structure (manholes etc).

6.10 Retaining walls

The construction of retaining walls is subject to the following requirements:

- Where the footings of a wall would encroach on the zone of influence the wall is to be designed in accordance with Section 7.5.
- Generally, walls more than 1m in height would not be permitted within 1m of the sewer main.
- Minimum cover over the main is to be maintained or an Engineer's assessment is required for protection of the main.
- The wall is to be set back at a minimum of 1.5m from the centre of a sewer maintenance structure.
- A retaining wall less than 1m in height will be permitted over or within the zone of influence without the requirement for an Engineer's design provided that:
  - the wall is at least 3m from an adjoining property or building/structure;
  - The wall would not be subject to vehicle loadings.
- Any retaining wall crossing a sewer main must be supported over the main with a reinforced concrete foundation designed in accordance with Section 7.5 to ensure no loads from the wall are transferred to the sewer main ie. bridging slab foundation.

6.11 Filling over sewer mains

The allowable depth of fill that can be placed over a sewerage main depends on the material type and stiffness class of the existing pipe. Site filling that increases the depth to the main above 2.5m will require an application to Council and subsequent approval. Any application must include certification from suitably experienced qualified civil, structural or geotechnical engineer that:

- The loading imposed will not adversely affect the underlying sewer, or
- The remediation work proposed will prevent any adverse loading on the underlying sewer.

The placing of fill to excessive depths over Council's main is not permitted (5m is a maximum depth for practical access) regardless of the structural capacity of the pipe. No fill is to be placed over sewer manholes and manholes are to be raised in conjunction with any site filling.

Finished lid levels of maintenance structures, relative to ground level, will be advised by Leeton Shire Council based on the land use and prevalence of flooding.

6.12 Excavations over and adjacent to mains

6.12.1 Excavations

Generally, excavations over or adjacent to a sewer main are not to reduce the earth cover over the main to less than the minimum limits as detailed in Council's Engineering Guidelines for Subdivisions and Developments.

Any proposal to reduce cover over a sewer to less than the limits imposed in these guidelines will require an application to Council and subsequent approval. Any application must include, amongst other things, certification from a suitably experienced qualified civil, structural or geotechnical engineer that:

- The loading imposed will not adversely affect the underlying sewer, or
- The remediation work proposed will prevent any adverse loading on the underlying sewer.

6.12.2 Earth embankments

On sloping sites there is potential that earthworks down slope of an existing sewer main could present a risk for land slip or erosion of soil providing cover and/or side support to an existing sewer main.

Any proposed regrading of land immediately down slope of an existing sewer main should be designed with a slope no steeper than 3 (horizontal) to 1 (vertical) to ensure future erosion and/or land slip does not reduce cover and/or support to the existing sewer main. Steeper embankments would be permitted where the embankment is certified by a suitably experienced qualified civil, structural or geotechnical engineer and approved by Council.

Retaining walls may be required to provide support down slope of existing sewer mains if substantial regrading is proposed.

6.13 High rise development

High rise development can present numerous operational challenges for the ongoing operation and maintenance of sewer mains. The developer must consider the following additional items as a minimum.

6.13.1 Sizing

As a requirement, the location of the trunk mains of 300mm Ø and greater (in basement) will not be approved by Council. Where such conflict occurs, the developer will be required to fund and arrange relocation (diversion) of the affected main to avoid such conflicts.

For mains of sizes less than 300mm Ø (in basement), Leeton Shire Council will examine each proposal on a case by case basis and reserves the right to decline approval requiring the developer to relocate (divert) the affected main.

If Council does however approve a particular proposal, Council may also set a range of conditions, as indicated below.

<u>Access to secured/locked complexes or basement car parks</u>
Should sewer mains be located within such areas, access by Council's staff must be available at all times. Details are to be provided that satisfy Council's access requirements.

Leeton Shire Council's access requirements are to be identified in the Strata Management Statement or similar.

Adequate clearances and locations for maintenance access
Where sewers are located in basement car parks, they are to be located to ensure that adequate and clear access is provided all around the sewer for all maintenance and replacement activities.

Adequate and safe clearances are to be provided for maintenance staff from the normal operation of the access to and from basement car parks. This may require the widening of accesses and ramps or the provision of additional sight distance within access areas.

Car spaces may be required to be orientated or located such that unimpeded access is available to the sewer at all times.

6.13.2 Protection
Should there be the likelihood of a vehicle impact to a sewer main, the main is to have adequate protection against such an impact.

The proposed protection type, treatment, strength, etc shall be subject to approval by Council. Should Council consider that the proposed sewer location presents a high likelihood of being impacted; the sewer main may be required to be relocated elsewhere at full cost to the developer.

6.13.3 Design
Any adjustment to sewer mains may have greater implications than solely to the area of the proposed development and as a result, no sewer main invert levels shall be raised. The raising of sewer mains may have significant impacts on the servicing potential of upstream properties.

Horizontal and vertical deflections may be permitted within the structure of the basements (e.g. pipes supported from the roof of the basement etc), however will not be permitted under or embedded in the concrete of the structures. Approved deflections shall not exceed 22.5°. The deflections or sweeping bends are to be provided with cleaning/flushing 'eyes'.

Where sewer mains are proposed to pass through (and out of) structures, the developer shall provide designs that allow for flexibility at joints and differential settlement. Such designs shall be subject to Council's approval.

Consideration shall be given where possible for the effects of any possible future development or redevelopment of adjoining properties.

All designs for Council sewer mains are to be in accordance with Water Services Association of Australia (WSAA).

Internal (domestic) sewer designs are to comply with the requirements of AS/NZS 3500 and the Building Code of Australia (BCA) as appropriate.

Existing manholes where practical is to be retained to provide greater flexibility for maintenance inspection and access.

6.13.4 Construction
Construction of Council sewer mains shall be in accordance with Water Services Association of Australia (WSAA).

Internal (domestic) sewers shall be in accordance with AS/NZS 3500 and the BCA as appropriate. Materials used for sewer work within and adjacent to the structures shall be ductile iron class (Flange) with stainless steel fittings unless otherwise approved.

The work shall provide for joint types and locations so that such joints are easily accessed for replacement/maintenance works with the minimum disruption of the operation of the system.

6.13.5 Safety and Health

All mains are to be clearly and frequently labelled for easy identification.

Additional lighting in basement car parks may be required adjacent to the sewer mains for identification, maintenance and replacement.

6.14 Abandoned mains

Pressure or gravity mains which have been abandoned due to relocation to suit a particular development may remain in the ground providing the abandoned mains are capped to prevent the movement of water. Leeton Shire Council may require certain abandoned mains to be backfilled with grout depending on size, material type and proximity to other structures.

Alternatively, the abandoned mains are to be removed and the trench backfilled and compacted to at least 98% standard compaction. Note that SafeWork NSW requirements will govern the handling of any asbestos cement materials (see also the Water Directorate's *Cutting, Handling and Disposal of Asbestos Cement (AC) Pipe Guidelines*, 2018).

6.15 Planting of trees

Tree roots can penetrate into sewerage pipes through joints or damaged sections of pipes, causing blockages and subsequent overflows. As a result, certain species are not recommended to be planted near sewer mains. A list of the highest risk species is provided in Appendix 1.

6.16 Costs

The Developer/Applicant will be responsible for all costs associated with:

- All investigation and design and any costs associated with seeking approval
- If approval is granted, then any construction costs
- Repairing any damage to a sewer main or associated sewer infrastructure caused by construction over or near an existing sewer.

If Leeton Shire Council decides to upsize a sewer main subject to relocation by a Developer, then a cost sharing arrangement may be agreed to between both parties that reflects the extra costs associated with installing a larger diameter main at the time of relocation by the Developer. Note this may not apply where the upsizing of the pipe is required due to the subject development.

The Developer/Applicant will have no claim on Council for any costs incurred in the event that approval is not granted.

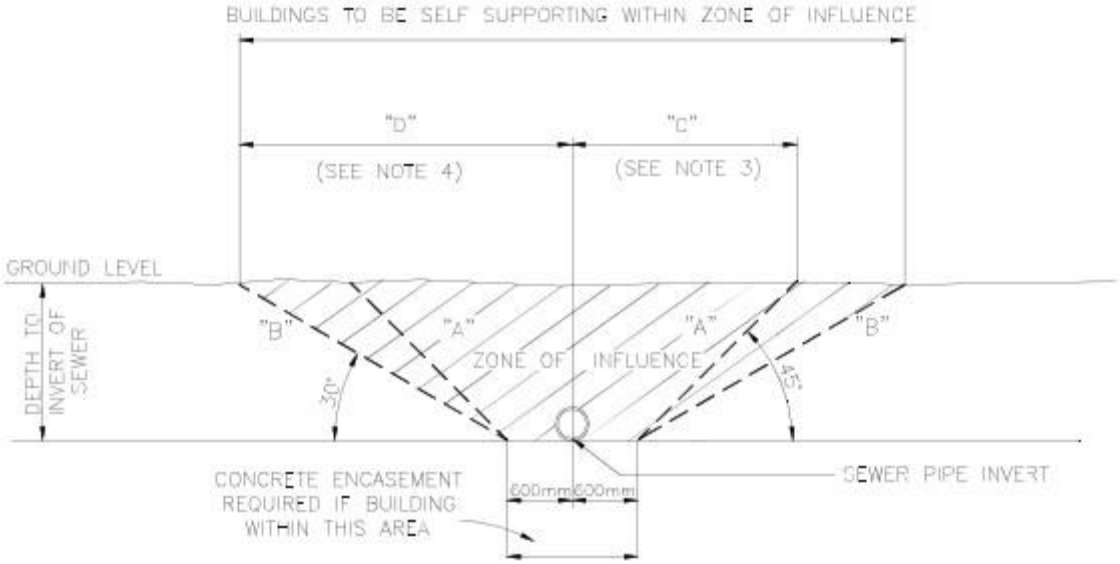
7. Building in the vicinity of Trunk Water Mains

Building in the vicinity of trunk water mains will not be permitted.

Appendix 1 – Plants to Avoid Near Sewer Mains

Botanical name	Common name	Damage rating
Cinnamomum camphora	Camphor Laurel	Extreme
Ficus species	Fig Trees & Rubber Plants	Extreme
Populus species	Poplars	Extreme
Salix species	Willows	Extreme
Erythrina species	Coral Trees	Very High
Eucalyptus species	Large Gum Trees	Very High
Jacaranda mimosifolia	Jacaranda	Very High
Liquidambar styraciflua	Liquidambar	Very High
Araucaria species	Norfolk Island & Bunya Pines	Very High
Brachychiton acerifolium	Illawarra Flame Tree	Very High
Casuarina species	Casuarinas	Very High
Melia azedarach	Australian White Cedar	Very High
Pinus species	Pine Trees	Very High
Platanus acerifolia	Plane Tree	Very High
Schinus molle	Pepper Tree	Very High
Ulmus species	Elms	Very High
Bougainvillea species	Bougainvilleas	High
Cortaderia selloana	Pampas Grass	High
Grevillea robusta	Silky Oak	High
Ilex species	Hollies	High
Lagunaria patersonii	Norfolk Island Hibiscus	High
Ligustrum species	Privets	High
Magnolia species	Magnolias	High
Nerium oleander	Oleander	High
Phoenix canariensis	Canary Island Date Palm	High
Phyllostachus species	Bamboos	High
Toxicodendron species	Rhus Trees	High
Lophostemon confetus	Brush Box, Tristania	High
Wisteria species	Wisteria	High

Appendix 2 - Diagrams



NOTES:

1. LINE "A" = ZONE OF INFLUENCE AT 1:1 (45°) FOR SOIL, CLAY ETC.
2. LINE "B" = ZONE OF INFLUENCE AT 2:1 (30°) FOR SAND, LOAM OR FILLED GROUND.
3. DISTANCE "C" REPRESENTS THE ZONE OF INFLUENCE WIDTH FOR 1:1 ZONE., ie. 0.6 METRE + DEPTH TO INVERT. NOTE : FOR LEVEL GROUND ONLY.
4. DISTANCE "D" REPRESENTS THE ZONE OF INFLUENCE WIDTH 2:1 ZONE ie. 0.6 METRE + (2 x DEPTH TO INVERT). NOTE: FOR LEVEL GROUND ONLY.
5. ON SLOPING GROUND, DISTANCES "C" AND "D" WILL VARY FOR UPSLOPE/DOWNSLOPE EXTENT OF ZONE OF INFLUENCE.

Figure 1 - Zone of Influence

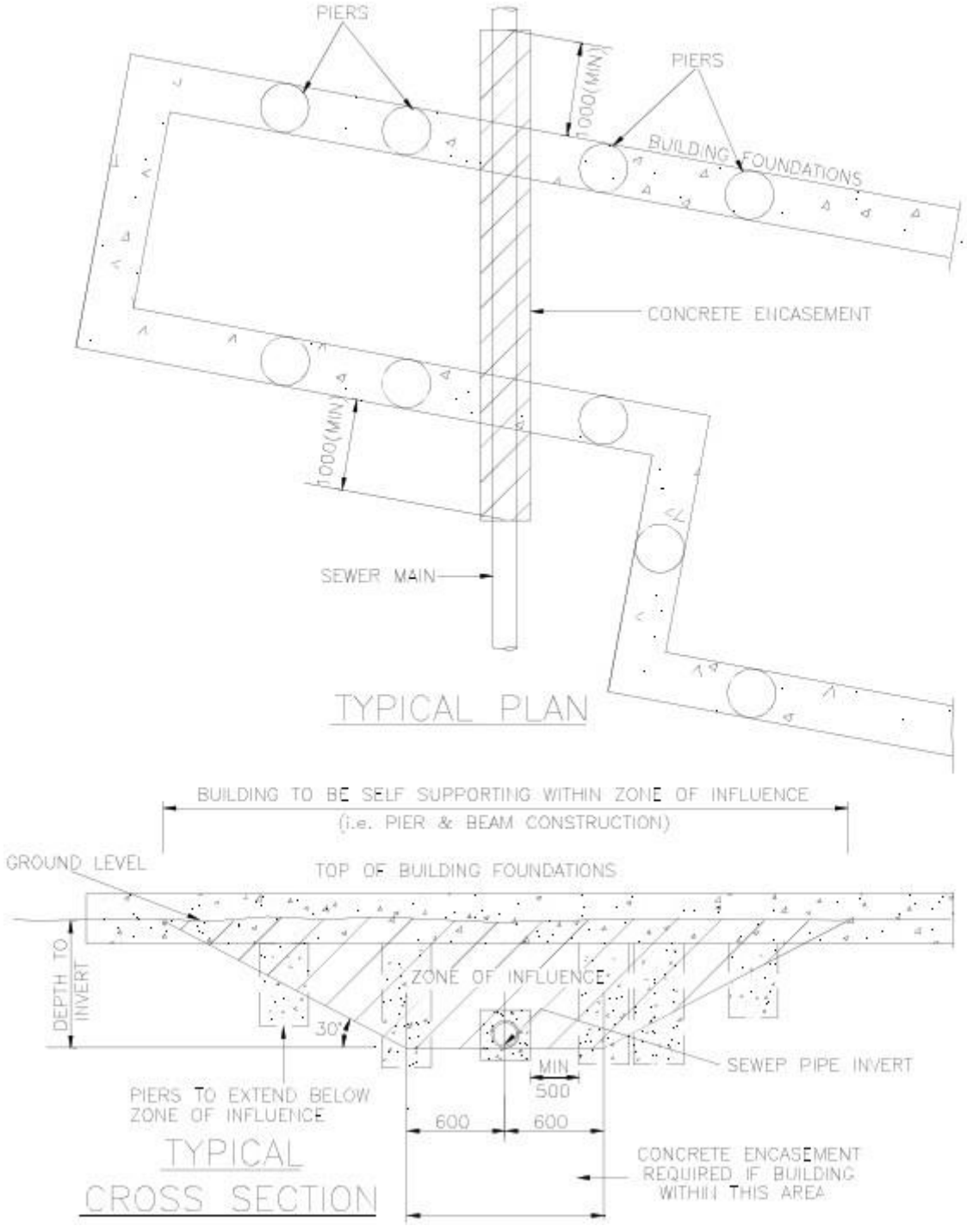


Figure 2 - Example Drawing for Building Over/Near Sewer mains for 2:1 zone of influence

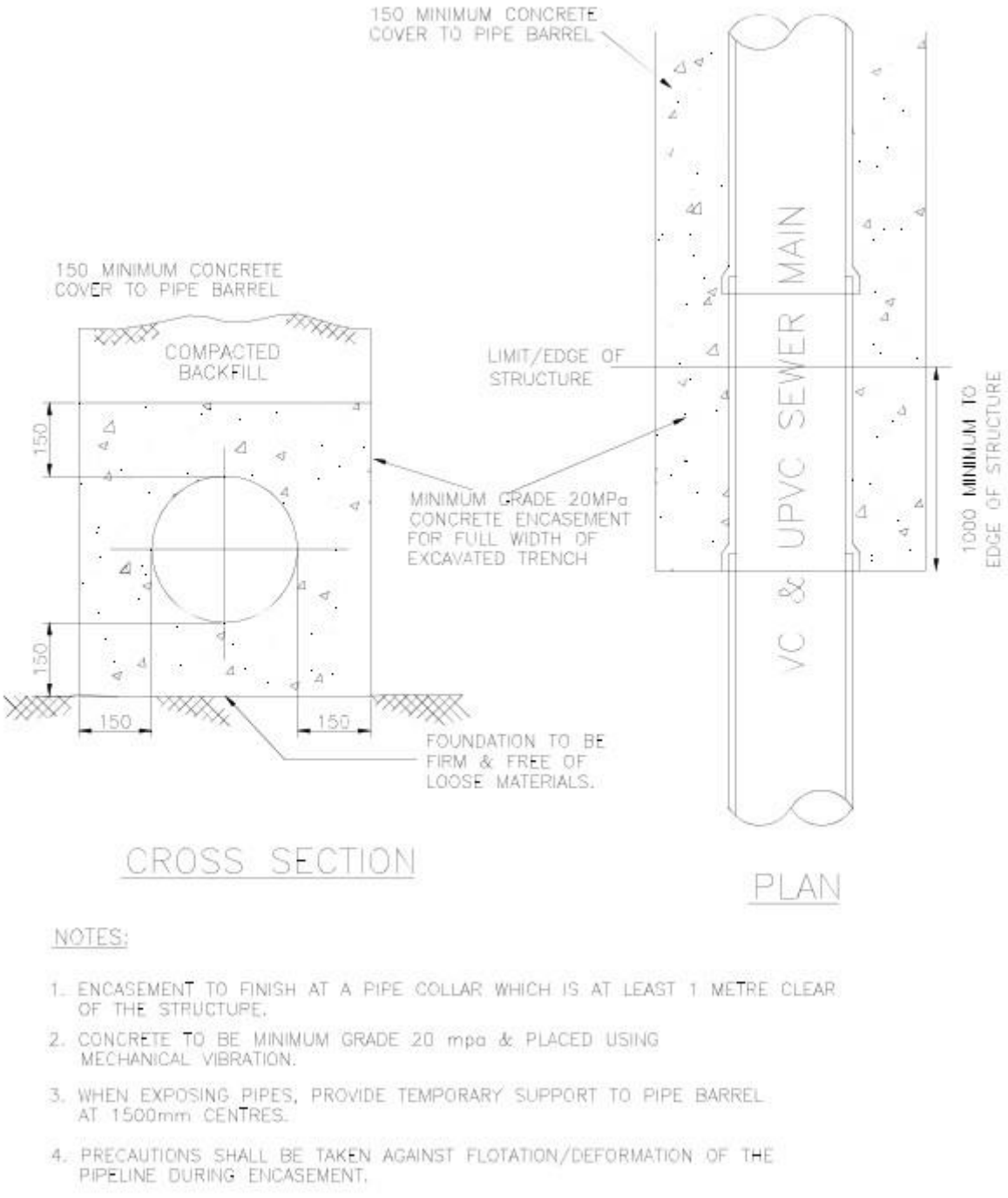
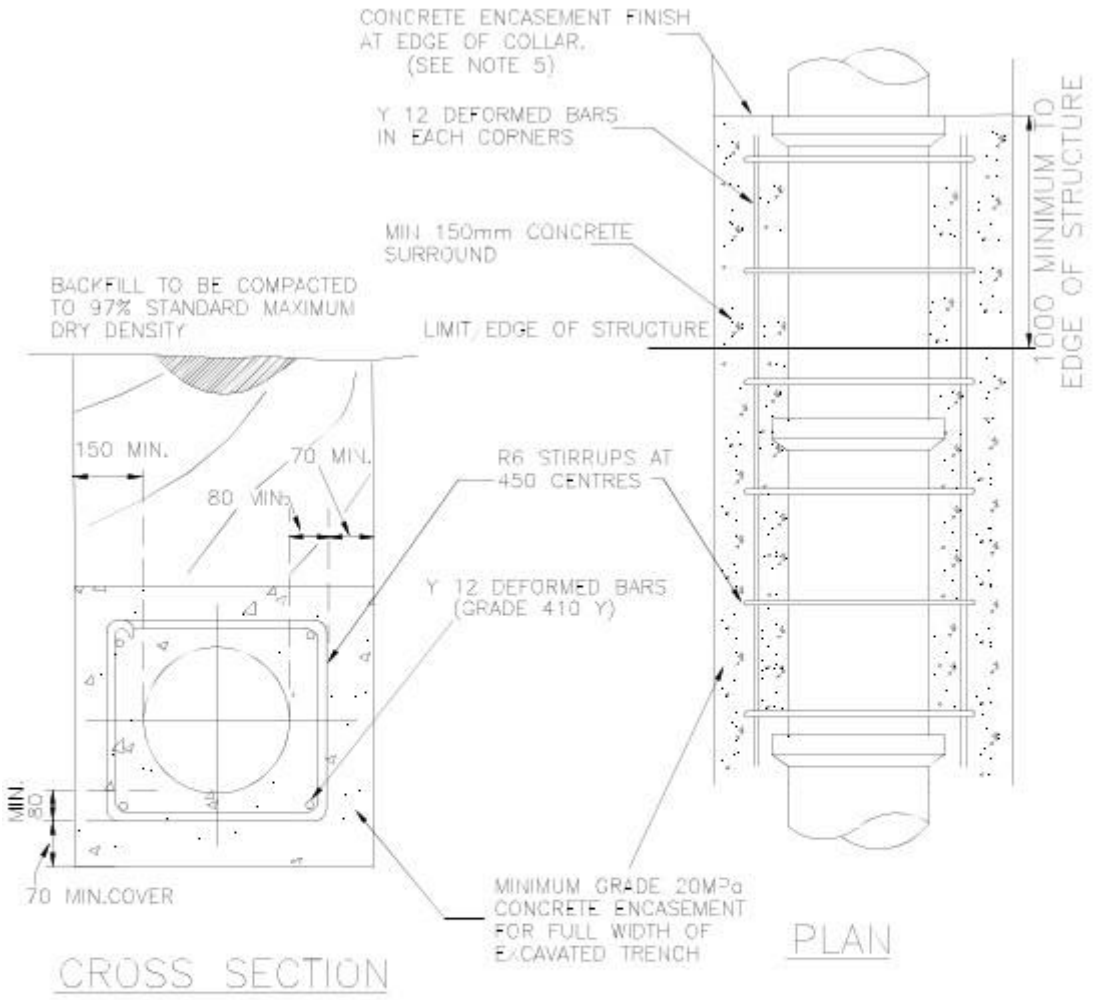


Figure 3 – Example Concrete Encasement Protection for sewer mains



NOTES:

1. CONCRETE TO BE MINIMUM GRADE 20 MPA AND PLACED USING MECHANICAL VIBRATIONS.
2. MINIMUM REINFORCEMENT LAP LENGTH TO BE 450 mm.
3. MINIMUM CONCRETE COVER TO REINFORCEMENT TO BE 70 mm.
4. REINFORCEMENT TO BE SECURELY TIED WITH ANNEALED WIRE AT ALL CROSSINGS.
5. WHERE THE SEWER MAIN IS TO BE CONCRETE ENCASED, THE ENCASEMENT SHALL EXTEND TO A COLLAR LOCATED NOT LESS THAN 1000m BEYOND THE OUTSIDE EDGE OF THE STRUCTURE.

Figure 4 – Example Reinforced Concrete Encasement Protection for sewer mains