Asset Lifecycle – Guidance Note

Shallow sewer installation

Purpose

The purpose of this Guidance Note is to define a consistent approach where installation of a shallow network gravity sewer is unavoidable.

Shallows sewers are a departure from Watercare standards, and the designer or constructor therefore must obtain approval before proceeding. All reasonably practical options must be exhausted and assessed by Watercare as impractical

Overview

Public gravity sewers are generally installed in trenches with a minimum cover of 900mm above the pipe crown. This takes into consideration the pipe material, trench and backfill conditions, as well as the external loads the pipe is expected to experience throughout its operational life.

Although this is the standard requirement and best practice, there are cases where it is unachievable to design and install the pipe with the necessary cover due to the location of private properties and site contours.

Public sewers may also require wye-junctions to be installed where private lateral connections link up with the main sewer line. To meet Watercare's standards the following requirements need to be met:

- Pipe material shall have inherent strength capable of withstanding imposed loading, including deadloads and live (traffic) loads.
- Pipe external corrosion protection to meet the intended design life (100 years).
- Minimum pipe internal diameter needs to be 150mm (public gravity sewers).
- Internal lining of the pipe needs be hydrogen sulphide (H_2S) resistant as the pipe will only be partially full, leaving air gaps for gas build-up and potential corrosion.
- The pipe and wye junction needs to be dimensionally compatible (i.e. correct fit) with no significant difference of the internal diameters to maintain the hydraulic profile.
- An acceptable connection or transition between the load-bearing pipe and a manhole structure.

References

Watercare

- Code of Practice for Land Development and Subdivision – Chapter 5: Wastewater
- **MS**: Material Supply Standard

Other

- **AS/NZS 2280:** Ductile iron pipes and fittings
- **AS 3680:** Polyethylene sleeving for ductile iron piping
- **WSAA TN6:** Guidelines for the use of cement mortar lining in sewerage applications

Product review

Multiple pipe products including Cement lined steel (CLS), Ductile Iron (DI) or Schedule 40 Epoxy Lined Steel (ELS) are structurally appropriate for shallow sewer installations as they provide the necessary strength to deal with non-typical loading conditions. However, although these materials have proven to be H_2S resistant, the internal and external dimensions which vary across products must be considered.

Recommendation

Based on these dimensional requirements, and the collection of acceptable products available at the time of publishing, Saint-Gobain Integral Zinalium® ductile iron pipes with Derwent wye-junctions provides the most compatible solution to link lateral property connections to shallow public sewers, as outlined in Table 1.

These products are readily available, meeting the requirements stipulated.

Private lateral connections can be fitted to the Derwent wye-junction using an acceptable shear band pipe coupling (refer to Watercare's Material Supply Standard) as this is generally a spigot-to-spigot connection.

Furthermore, the ductile iron pipe can be connected to a manhole using an accepted u-PVC Series 2 Hydro connector. It is important that the DI pipe be inserted well into the manhole starter and finisher to provide additional support and allow for the benching to align to the upstream and downstream inverts (refer Figure 3).

Table 1: Acceptable DI product compatibility.

Criteria	Ductile Iron (DI)
External corrosion protection of pipe	Yes – Zinalium alloy (400 g/m^2)
Minimum internal diameter (150mm)	152mm (AS/NZS 2280)
Internal lining H2S resistant	Yes – Calcium Aluminate Cement
Compatible wye-junction	Derwent wye-junction (150mm I.D.)
Connection to manhole	PVC-U Series 2 Hydro connector

Figure 1: Internal bore of ductile iron pipe and Derwent wye-junction aligning

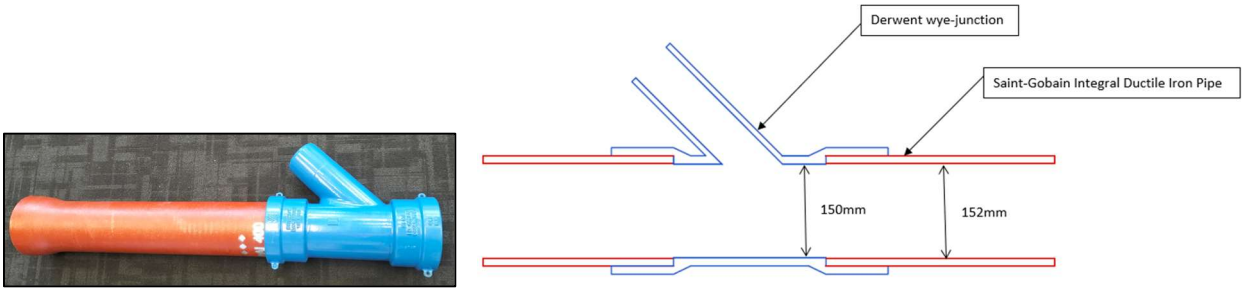


Figure 2: Layout and dimension of DI pipe and wye-junction

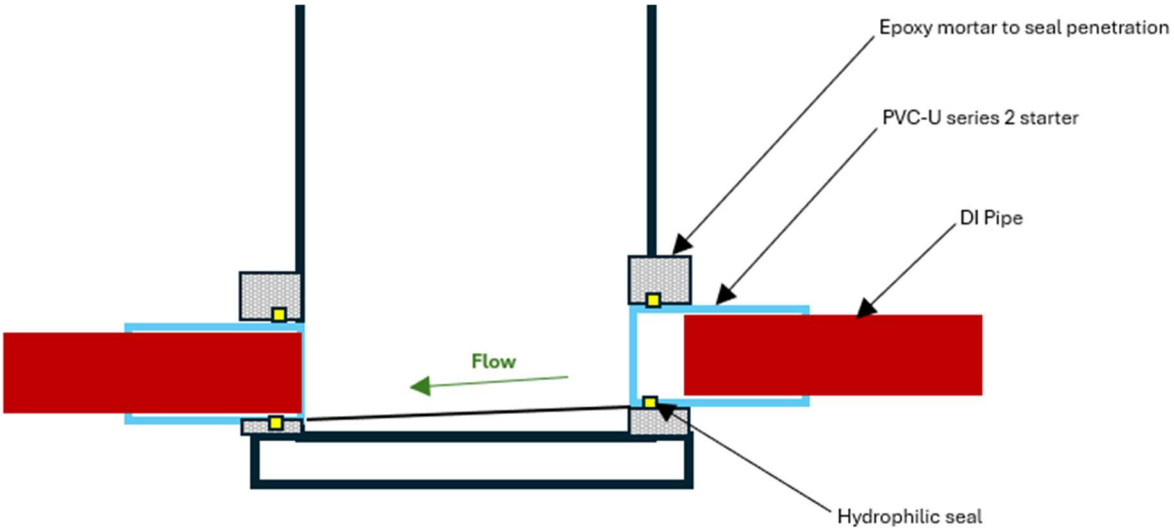


Figure 3: Simplified illustration of installation at manhole

Considerations

Ground Conditions

The Saint-Gobain Integral Zinalium® ductile iron pipes can generally be directly buried without additional corrosion protection; however, a ground investigation should be carried out as part of the design to confirm the characteristics of the surrounding geology. Should any of the characteristics listed below be apparent, the ductile iron pipes shall be wrapped with polyethylene sleeving in accordance with AS 3680.

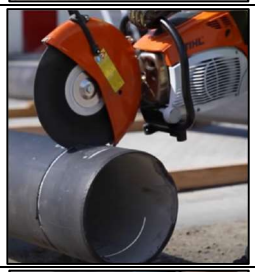
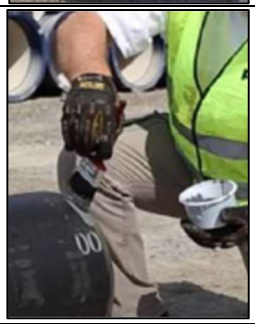
- Soils with a resistivity lower than 500 Ω.cm
- Peaty and acidic soils
- Soils containing acidic industrial effluents, ashes, slag or other contaminants (i.e. closed landfills)

Material manufacturing standards

The pipes used for this application shall conform with AS/NZS 2280 manufacturing standards. Other equivalent standards also exist (e.g. EN 598), however the dimensions do not fully align with AS/NZS standards which may result in unacceptable jointing and low-pressure testing to confirm leak-free joints.

Fitting of DI pipework

Should the ductile iron pipe require custom lengths between fittings or the manhole connection, this can be achieved by following the steps below:

Step	Illustration
1. Marking the pipe to the required length	
2. Cutting the pipe to size using a concrete cutting saw	
3. Cleaning and bevelling the edges of the ductile iron pipe	
4. Painting the exposed pipe surface with the manufacturer approved coating	
5. Rendering epoxy concrete to account for any chipping that may have happened whilst cutting or cleaning