DEVELOPMENT CONSTRUCTION SPECIFICATION

C221

PIPE DRAINAGE

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
EXAMPLE 1	*Provision for acceptance of nonconformance with deduction in Payment*	*XYZ.00*	*AP*	*KP*	*2/6/97*
A	Review of AS and AS/NZS standards	C221.02	M	MD	11/12/2013

SPECIFICATION C221 : PIPE DRAINAGE

GENERAL

C221.01 SCOPE

1. This Specification covers the supply and installation of pipes and pipe arches for stormwater drainage.

2. This Specification shall be read in conjunction with the specification for STORMWATER DRAINAGE - GENERAL. ***Associated Specifications***

3. The work to be executed under this Specification consists of supply of pipes and pipe arches, bedding, installation and backfilling. ***Extent of Work***

C221.02 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated. ***Documents Standards Test Methods***

(a) Council Specifications

C213	-	Earthworks
C220	-	Stormwater Drainage - General
C230	-	Subsurface Drainage - General
C271	-	Minor Concrete Works

(b) Australian Standards

AS 1141.11	-	Particle size distribution by dry sieving.
AS 1254	-	Unplasticized PVC (UPVC) pipes and fittings for storm or surface water applications.
AS 1289.3.3.1	-	Calculation of the plasticity index of a soil.
AS 1289.D3.1	-	Determination of the pH value of a soil - Standard method.
AS 1289.D4.1	-	Determination of the electrical resistivity of sands and granular materials.
AS 1289.E6.1	-	Compaction control test - Density index method for a cohesionless material.
AS 1397	-	Steel sheet and strip - Hot-dipped zinc coated or aluminium/zinc coated.
AS 1650	-	Hot-dipped galvanised coatings on ferrous articles.
AS/NZS 2032	-	Code of practice for installation of UPVC pipe systems.
AS 2105	-	Inorganic zinc silicate paint.
AS/NZS 3725	-	Loads on buried concrete pipes.
AS/NZS 4058	-	Precast concrete pipes
AS 4139	-	Fibre reinforced concrete pipes and fittings.

COMMON REQUIREMENTS

C221.03 GENERAL

1. All pipes and pipe arches shall comply with the appropriate Australian Standards. ***Load Testing***

2. The Contractor shall take all necessary steps to drain the excavation to allow the foundation, the bedding and any backfilling to be compacted to the specified ***Excavation Drainage***

relative compaction.

3. Pipes shall be installed within 20 mm of the grade line and within 50 mm of the horizontal alignment specified on the Drawings. The Contractor shall re-lay any pipe which is not within these tolerances. ***Tolerances***

4. At the discharge end of pipes terminating at pits and headwalls a 3m length of 100mm diameter subsurface drain shall be laid in the trench 100mm above the invert level of the pipe and discharging through the wall of the pit. The subsurface drainage pipe shall be sealed at the upstream end and shall be enclosed in a seamless tubular filter fabric in accordance with the Specification for SUBSURFACE DRAINAGE. ***Subsurface Drain***

5. Where the Contractor proposes to travel construction plant or vehicles over pipes, the Contractor shall design and provide adequate protective measures for the pipes. ***Construction Plant Movement***

REINFORCED CONCRETE AND FIBRE REINFORCED CONCRETE PIPES

C221.04 PIPES

1. Reinforced concrete pipes shall comply with AS/NZS 4058 and shall be of the class and size as shown on the Drawings. ***Reinforced Concrete Pipes***

2. Fibre reinforced concrete pipes shall comply with AS 4139 and shall be of the class and size as shown on the Drawings ***Fibre Reinforced Pipes***

3. Pipe joints shall be rubber ring joints as recommended by the manufacturer. ***Joints***

C221.05 CONDITIONS OF INSTALLATION

1. Unless otherwise indicated on the Drawings or approved by the Principal Certifying Authority, the formation shall be completed to subgrade level and the pipes then installed in the normal trench condition. ***Formation to Subgrade Level***

2. Installation shall be in accordance with this Specification and AS/NZS 3725 and AS/NZS 3725 Supplement 1. Type HS3 support shall be used in road reserves. Type HS2 support shall be used elsewhere unless a higher standard is noted on the Drawings.

3. For normal trench conditions, the pipe shall be laid in an excavated trench with bedding as specified below. The trench shall not be excavated wider than 1.4 times the external diameter of the pipe plus 300mm. ***Normal Trench Conditions***

4. For a single pipe, embankment conditions apply when $W > D_e + 1$ metre. Where W = Width of trench (m) and D_e is the pipe external diameter (m). ***Wide Trench Conditions***

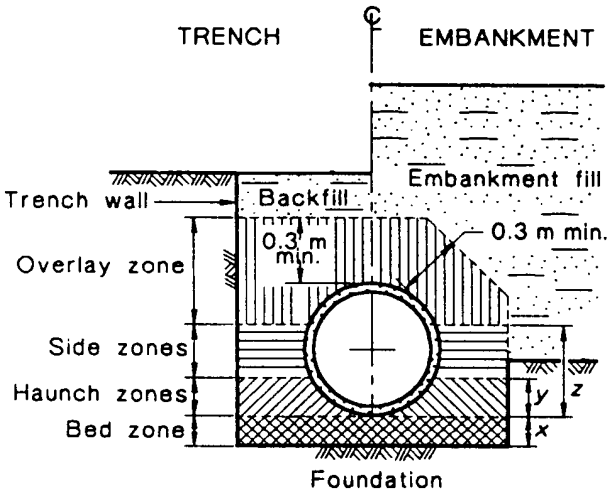
5. For multi-cell pipes, embankment conditions apply when $W > n D_e + nS + 1$ metre where n is the number of pipe cells, D_e is the pipe external diameter (m) and S is the square spacing between the pipelines (m).

C221.06 BEDDING

1. Unless otherwise shown on the Drawings, the bedding requirements shall be as ***Requirements***

set out in this clause.

2. Figure C221.1 indicates the proportionate dimensions of bedding and backfilling for pipes laid in trench conditions and embankment conditions. ***Bedding Dimensions***



where, Z = 0.7D
Y = 0.3D
X = 100mm for D < 1500mm
X = 150mm for D > 1500mm
D = Internal Diameter of Pipe

Figure C221.1
Pipe Installation Conditions

3. Bedding material for the bed and haunch zones shall consist of a granular material having a grading, determined by AS 1141.11, complying with Table C221.2, and a Plasticity Index, determined by AS 1289.3.3.1 of less than 6. ***Material Requirements***

Sieve size mm	Mass passing %
19.0	100
2.36	100 - 50
0.60	90 - 20
0.30	60 - 10
0.15	25 - 0
0.075	0

Table C221.2
Bedding Material Grading Limits

4. The Contractor shall advise the Principal Certifying Authority of the source of bedding material. ***Source***

5. Bedding material in the bed and haunch zones shall be placed and compacted in ***Compaction***

layers to a minimum density index of 70 per cent as determined by AS 1289.E6.1. ***Requirements***

6. Reserved

C221.07 INSTALLATION

(a) General

1. Pipes shall be laid with the socket end placed upstream. Pipes which have marks indicating the crown or invert of the pipes shall be laid strictly in accordance with the markings. Unless specified, no individual length of pipe shall be shorter than 1.2m. ***Positioning of Pipes***

2. In the case of pipes 1.2 m or more in diameter, laid in situations where embankments are to be more than 3m high, measured above the invert of the pipe, pipes shall be stiffened temporarily by the Contractor by interior timber struts, erected before filling is placed. Struts shall be of hardwood measuring at least 100mm by 100mm or 125mm diameter. One strut shall be placed in a vertical position at each pipe joint; thence at spacing not greater than 1.2 m. Struts shall bear against a sill laid along the invert of the pipe and a cap bearing against the crown of the pipe. Both the sill and the cap shall be continuous throughout the length of the pipe and they shall be of sawn hardwood, of cross section not less than 100mm by 100mm. Struts shall be made to bear tightly by the use of wedges between the top of the struts and the cap. Struts, sills and caps shall be removed on completion of the embankment, unless removal is ordered earlier. ***Stiffening of Culverts***

3. Lifting holes in pipes shall be sealed before the commencement of backfilling with an appropriate plug specifically designed for the purpose. Where a lifting hole has been made in a length of pipe by the contractor, it shall be sealed with 3:1 sand: cement mortar. ***Seal Lifting Holes***

(b) Joints in Steel Reinforced Concrete Pipes

(i) Rubber Ringed Joints

1. Before making the joint, the spigot and socket and the rubber ring shall be clean and dry except for any lubricants recommended by the manufacturer. ***Clean and Dry Material***

2. The rubber ring shall be stretched on to the spigot end of the pipe, square with the axis and as near as possible to the end, care being taken that it is not twisted. The spigot end of the pipe shall then be pushed up to contact the socket of the pipe with which it is to join, and be concentric with it. The spigot end shall then be entered into the socket of the already laid pipe and eased home. ***Procedure***

3. The joint shall be tested to ensure that the rubber ring has rolled evenly into place. ***Joint Test***

(c) Joints in Fibre-Reinforced Concrete Pipes

(i) New Pipes

1. Joints shall be of a flexible type. Rubber rings shall be used to seal joints in both rebated and spigot and socket jointed pipes in the manner specified in Clause C221.07(b). Alternatively, a jointing compound comprising plasticised butyl rubber and inert fillers may be used to seal such pipes in accordance with the manufacturer's instructions. ***Procedure***

C221.08 BACKFILL

1. Roads, Carriageways and Accessways. Backfill to the side, overlay and backfill zones shall consist of material defined in Table C221.2. Backfill to the side, overlay and backfill zones shall be compacted to density index of not less than 70. ***Procedure***

2. Council or Public Drainage Easements and Interallotment Drainage Easements. Backfill to the side and overlay shall consist of material defined in Table C221.2 and shall be compacted to a density index of not less than 70. The backfill zone shall comprise material that is clean, free from large rock, organic matter, builders refuse and other debris and has a maximum particle size of 50 mm. The backfill zone shall be compacted to a relative compaction of 95% Standard Compaction.

3. Backfilling on both sides of the pipe and both sides of the wingwalls shall be carried out simultaneously. Backfilling and compaction shall commence at the pipe or wall so as to confine remaining uncompacted material at commencement. ***Sequence***

uPVC PIPES

C221.19 PIPE MATERIALS

1. Unplasticised PVC (uPVC) Pipes and Fittings shall be manufactured in accordance with AS 1254. ***Specification***

C221.20 INSTALLATION

1. The materials utilised, the excavation requirements, bedding, backfill and jointing requirements for uPVC pipes are those set out in Section 7 of AS/NZS 2032. Installation of all uPVC pipes shall comply with the requirements of this Australian Standard.

LIMITS AND TOLERANCES

C221.26 SUMMARY OF LIMITS AND TOLERANCES

Item	Activity	Tolerances	Spec Clause
1.	**Pipe Position**		
	(a) Grade Line	± 10mm	C221.03
	(b) Horizontal Alignment	± 50mm	C221.03
2.	**Bedding**		
	(a) Compacted Layers	< 150mm	C221.06
3.	**Installation**		
	(a) Normal Trench (i) Trench Width	<1.4 x External Diameter + 300mm	C221.05
	(b) Pipe Length	Not less than 1200mm	C221.07a
	(c) Strut Stiffening (i) Timber Size	> 100mm x 100mm	C221.07a
	(ii) Spacing	< 1200mm	C221.07a

Table C221.2 - Limits and Tolerances

SPECIFICATION C221 - PIPE DRAINAGE