QUEANBEYAN PALERANG REGIONAL COUNCIL

DEVELOPMENT CONSTRUCTION SPECIFICATION

C220

STORMWATER DRAINAGE

GENERAL

VERSION 1 – DECEMBER 2018

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
VERSION 3.1	Scope of works extended and requirements for Inspections added	C220.02	A	KD	11/03/10
	Standards updated	C220.04.1	M		
	Witness Point added	C220.05.2			
	Hold Point added	C220.05.3	A		
	Hold Point added	C220.06.3	A		
	Hold Point added	C220.07.4	A		
	Witness Point added	C220.07.6	A		
	Annexure added	C220-A	A		

SPECIFICATION C220
STORMWATER DRAINAGE – GENERAL – VERSION 1

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SPECIFICATION C220 : STORMWATER DRAINAGE – GENERAL – VERSION 1

GENERAL

C220.01 INTRODUCTION

Purpose

1. Drainage works shall form a complete system carrying water through and away from the Works.

2. This is the general Specification common and applicable to all types of drainage lines, open drains, kerb and gutter, and drainage structures and shall be read in conjunction with drainage Specifications:

C221	-	Pipe Drainage - Version 1
C222	-	Precast Box Culverts - Version 1
C223	-	Drainage Structures - Version 1
C224	-	Open Drains, including Kerb and Gutter - Version 1

as applicable to particular Contracts.

C220.02 SCOPE

1. The work to be executed under this Specification consists of:

(a) preparation for stormwater drainage construction,

(b) temporary drainage during construction,

(c) siting of pipes, pipe arches and box culverts,

(d) all activities and quality requirements associated with excavation and backfilling,

(e) all concrete work associated with stormwater drainage,

(f) demolition and removal of existing redundant pipes and drainage structures.

Quality

2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Inspections

3. The Contractor shall give notice so that inspection may be made of all HOLD POINTS and WITNESSS POINTS documented in this specification and tabulated in Annexure C211-A.. Release of HOLD POINTS and witness points shall be made by the Superintendent, with the concurrence of the Principal Certifying Authority, where stipulated in Annexure C220-A.

C220.03 EXTENT OF WORK

1. Details of the work are shown on the Drawings. The extent of works under this Contract is summarised as follows:

EXAMPLE (To be completed by compiler)

(a) *pipe culvert stormwater drainage*

(b) *precast box culvert stormwater drainage*

(c) *drainage pits, headwalls, wingwalls and aprons*

(d) *kerb and gutter*

(e) *open concrete dish drains*

(f) *scour protection of open drains at outlets to drainage structures*

(g) *demolition and removal of existing redundant pipe culverts, headwalls and pits.*

C220.04 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) Other Council Specifications

C211	-	Control of Erosion and Sedimentation - Version 1
C213	-	Earthworks - Version 1
C271	-	Minor Concrete Works - Version 1

(b) Australian Standards

AS 1141		Methods for sampling and testing aggregates
AS 1141.11.1-2009		Particle size distribution - Sieving method
AS 1289		Methods of testing soils for engineering purposes
AS 1289.1.1-2009	--	Soil classification tests - Determination of the plastic limit of a soil - Standard method
AS 1289.3.3.1-2009	-	Soil classification tests - Calculation of the plasticity index of a soil
AS 1289 4.3.1-1997	-	Soil chemical tests - Determination of the pH value of a soil - Electrometric method
AS 1289 4.4.1-1997	-	Soil chemical tests - Determination of the electrical resistivity of a soil - Method for sands and granular materials
AS 1289.5.4.1-2007	-	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1289.5.7.1 – 2006	-	Soil compaction and density tests - Compaction control test – Hilf density ratio and Hilf moisture variation (Rapid Method)
AS/NZS 2041:1998		Buried corrugated metal structures
AS/NZS 2566		Buried flexible pipelines
AS/NZS 2566.1-1998		Structural design - Commentary
AS/NZS 2566.2-2002		Installation
AS 3600-2009		Concrete structures
AS 3725- 2007		Design for installation of buried concrete pipes
AS 3735-2001		Concrete structures retaining liquids

(c) Other

NSW Department of Environment and Climate Change

RESOURCE NSW – *Specification for Supply of Recycled Materials for*

Pavements, Earthworks and Drainage, 2003.

NSW Department of Environment and Conservation – 2006
Managing Urban Stormwater – Harvesting and Reuse.

CONSTRUCTION

C220.05 TEMPORARY DRAINAGE DURING CONSTRUCTION

1. All drainage works carried out by the Contractor shall comply with the Specification for CONTROL OF EROSION AND SEDIMENTATION - VERSION 1. ***Control***

2. The Contractor shall make adequate provision for runoff flows at drainage works under construction to avoid damage or nuisance due to scour, sedimentation, soil erosion, flooding, diversion of flow, damming, undermining, seepage, slumping or other adverse effects to the Works or surrounding areas and structures as a result of the Contractor's activities. This is a **WITNESS POINT**. ***Contractor's Responsibility (WP)***

3. The Contractor shall not implement any proposals to dam up or divert existing watercourses (either temporarily or permanently) without prior approval by way of approved Drawings or written instruction. This is a **HOLD POINT**. ***Limitations (HP)***

4. The Contractor's material and equipment shall be located clear of watercourses or secured so that they will not cause danger or damage in the event of large runoff flows. ***Location of Equipment***

C220.06 SITING OF CULVERTS

1. Before commencing construction of any culvert, the Contractor shall set out on site the culvert inlet and outlet positions to the location and levels shown on the Drawings, and shall present this set-out for inspection by the Superintendent. ***Set-out***

2. The Superintendent may amend the inlet or outlet locations or designed levels or the culvert length to suit actual site conditions. Any activity resulting from such amendments by the Superintendent shall be deemed to be included as part of the work covered by the Schedule of Rates. ***Amendments to planned work***

3. Should the Contractor propose changes to the culvert location, length, designed levels, culvert strength, conditions of installation or cover to suit the construction procedures, the Contractor shall present the proposed culvert set-out in addition to the designed set-out for consideration by the Superintendent and Council. No changes shall be made unless the prior written approval of the Superintendent is obtained. This is a **HOLD POINT**. ***Proposed Changes by Contractor (HP)***

C220.07 EXCAVATION

1. Before undertaking stormwater drainage excavation, topsoil shall be removed in accordance with the Specification for EARTHWORKS - VERSION 1. ***Topsoil***

2. In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements. ***Safety***

3. Where public utilities exist in the vicinity of stormwater drainage works the Contractor shall obtain the approval of the relevant authority to the method of excavation before commencing excavation. ***Approval by Public Utility Authorities***

4. Excavation by blasting shall not be undertaken unless written approval is gained from the PCA. This is a **HOLD POINT**. If permitted, shall be carried out to ensure that the peak particle velocity measured on the ground adjacent to any previously installed culvert of drainage structure does not exceed 25 millimetres per second. The Contractor shall comply with other requirements concerning blasting operations in the Specification for EARTHWORKS -VERSION 1. ***Blasting Operation (HP)***

5. Trench or foundation excavation for stormwater drainage works shall be undertaken to the planned level for the bottom of the specified bedding or foundation level. All loose material shall be removed by the Contractor. ***Excavation Level***

6. Any material at the bottom of the trench or at foundation level which the Superintendent deems to be unsuitable shall be removed and disposed in accordance with the Specification for EARTHWORKS - VERSION 1 by the Contractor and replaced with backfill material in accordance with the requirements of this Specification and the Specifications for particular culvert types. This is a **WITNESS POINT.** The bottom of the excavated trench or foundation, after any unsuitable material has been removed and replaced, shall be parallel with the specified level and slope of the culvert. ***Unsuitable Material (WP)***

7. The excavated material shall be used in the construction of embankments backfilling or spoiled in accordance with the Specification for EARTHWORKS - VERSION 1. ***Spoil***

C220.08 BACKFILLING

1. Backfilling shall be carried out in accordance with the requirements of the relevant culverts or drainage structures Specifications and to the compaction requirements specified below.

Note to Compiler :- Due regard may be taken of the opportunity to use recycled materials for backfill of stormwater pipe trenches– (RESOURCE NSW - *Specification for Supply of Recycled Materials for Pavements, Earthworks and Drainage*, 2003.). Note: Disclaimer in front cover of specification under “important” re liability.

C220.09 COMPACTION

1. Foundations, bedding (other than for pipe drainage) and backfilling shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for standard compactive effort.

	Relative Compaction
Foundations or trench base to a depth of 150mm below foundation levels	95%
Material replacing unsuitable material	95%
Bedding material (other than for pipe drainage)	95%
Selected backfill and ordinary backfill material	
• below 1.5m of finished surface	95%
• within 1.5m of finished surface	100%
Backfill material within the selected material zone	100%

Compaction requirements adjacent to pipe drainage for concrete, steel or UPVC pipes are set out in the specification for PIPE DRAINAGE - VERSION 1.

Layers

2. All material shall be compacted in layers not exceeding 150mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced.

Moisture Content

3. At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.7.1 (standard compaction).

Precautions

Contractor's Cost

4. When compacting adjacent to culverts or drainage structures, the Contractor shall adopt compaction methods which will not cause damage or misalignment to any culvert or drainage structure. Any damage caused shall be rectified, and all costs of such rectification shall be borne by the Contractor.

C220.10 CONCRETE WORK

Specification

1. For all concrete work, the Contractor shall comply with the Specification for MINOR CONCRETE WORKS – VERSION 1 in relation to the supply and placement of normal class concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection.

C220.11 SPRAYED CONCRETE

Standard

1. If sprayed concrete has been specified, shown on the Drawings or directed by the Superintendent, it shall comply with requirements in the Specification for MINOR CONCRETE WORKS - VERSION 1.

SPECIAL REQUIREMENTS

C220.12 RESERVED

C220.13 RESERVED

LIMITS AND TOLERANCES

C220.14 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table C220.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	**Excavation by Blasting**		
	peak particle velocity	≤25mm/sec	C220.07
2.	**Relative Compaction (Standard)**		
	(a) Foundations or trench base to a depth of 150mm below foundation levels	95%	C220.09
	(b) Material replacing unsuitable material	95%	C220.09
	(c) Bedding material	95%	C220.09
	(d) Selected backfill and ordinary backfill material: • below 1.5m of finished surface • within 1.5m of finished surface	 95% 100%	C220.09
	(e) Backfill material within the selected material zone	100%	C220.09
3.	**Backfill**		
	(a) Layers	≤ 150mm	C220.09
	(b) Moisture Content	>60%, <95%	C220.09

Table C220.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT

C220.15 PAY ITEMS

1. Payment shall be made for all activities associated with completing the work detailed in this Specification and the associated activity specific specifications on a schedule of rates basis.

2. The Pay Items applicable to particular activities are listed in the Specifications for these activities.

3. Common to culverts and drainage structures is Excavation and payment for this shall be made under this Specification.

4. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION - VERSION 1.

5. Topsoil removal is measured and paid in accordance with the Specification for EARTHWORKS - VERSION 1.

6. Concrete work is measured and paid in accordance with the Specification for the particular drainage activities and not in the Specification for MINOR CONCRETE WORKS - VERSION 1.

7. Sprayed concrete work is measured and paid in accordance with the Specification for MINOR CONCRETE WORKS - VERSION 1.

8. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS - VERSION 1.

Pay Item C220(a) EXCAVATION FOR STORMWATER DRAINAGE CULVERTS AND STRUCTURES

1. The unit of measurement shall be cubic metre measured as bank volume of excavation.

2. The schedule rate for this Pay Item shall be an average rate to cover all types of material encountered during excavation. Separate rates shall not be included for earth and rock.

3. The rate is deemed to include:
   - Setting out and associated survey
   - Excavation, including excavation and replacement of unsuitable material
   - Replacement for over-excavation for any reason
   - Control of stormwater runoff, temporary drainage and erosion and sedimentation control.

4. The volumes of excavation for payment shall be computed as follows:

(i) **Reinforced Concrete and Fibre Reinforced Cement Pipes**

- Positive Projection (if excavation required)
  Width:
  - single cell: external pipe diameter + 1m.
  - multi cell: sum of external diameters + sum of spacings between pipes measured square to the line of the culvert + 1m.

Depth:
- in natural ground: average actual depth from topsoil stripped ground surface to underside of specified bedding.

- in embankment: average actual depth or 500mm above top of pipe to underside of specified bedding, whichever is lesser.

Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

- Wide Trench
  Width:
  - single cell: external pipe diameter + 1m.
  - multi cell: sum of external diameters + sum of spacings between pipes measured square to the line of the culvert + 1m.

  Depth:
  - in natural ground: average actual depth from topsoil stripped ground surface to underside of specified bedding.

  - in embankment: maximum 500mm above top of pipe to underside of specified bedding.

  Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

- Normal Trench
  Width: 1.4 times external pipe diameter or external pipe diameter +300mm on each side, whichever is the greater..

  Depth:
  - in natural ground: average actual depth from topsoil stripped ground surface to underside of specified bedding.

  - in embankment: maximum 500mm above top of pipe to underside of specified bedding.

  Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

(ii) **Steel Pipes and Pipe Arches**

Width:
- wide trench: external pipe diameter or span + 2 x external pipe diameter or span.

- normal trench: external pipe diameter or span + 600mm on each side.

Depth: as for RC and FRC pipes.

Length: actual excavation length.

(iii) **UPVC Pipes**

Width: For pipes of:-:

Ext. dia at collar ≥75 ≤150	external diameter of pipe plus 200mm
Ext. dia at collar >150 ≤300	external diameter of pipe plus 300mm
Ext. dia at collar >300 ≤450	external diameter of pipe plus 400mm

Depth: average actual depth excavated.

Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

(iv) **Box Culverts**

The plan area for payment shall be the area calculated from the outside dimensions of the base slab plus 300mm and wingwalls as shown on the Drawings. The depth for payment shall be the average actual depth below ground surface stripped of topsoil to the bottom of the specified bedding.

(v) **Other Drainage Structures**

The plan area for payment shall be the area calculated from the outside dimensions of the structure as shown on the Drawings. The depth shall be determined from the actual site measurement of the surface at the time of excavation to the underside of the bedding.

(vi) **Unsuitable Material under Culverts and Drainage Structures**

The volume for payment of material which the Superintendent deems unsuitable shall be calculated from the actual plan area of material removed and the average actual depth below the bottom of bedding. It shall be replaced with ordinary backfill material either from drainage excavations or from Earthworks.

ANNEXURE C220-A

INSPECTIONS

Notice

Give notice so that the inspection may be made of the following:

Summary of HOLD POINTS

Clause title/Item	Requirement	Notice for inspection	Release by
CONSTRUCTION			
Temporary Drainage During Construction			
C220.05.3 - Limitations	Obtain written approval to dam or divert existing watercourses	2 weeks prior to commencing site work	Superintendent – PCA concurrence required
Siting of Culverts			
C220.6.3 – Proposed Changes by Contractor	Obtain written notice of any proposed changes to culvert set-out or design.	2 weeks prior to commencing site work	Superintendent – PCA concurrence required
Excavation			
C220.07.4 – Blasting Operation	Obtain written approval to blast	2 weeks prior to commencing site work	Superintendent – PCA concurrence required

Summary of WITNESS POINTS

Clause title/Item	Requirement	Notice for inspection
CONSTRUCTION		
Temporary Drainage During Construction		
C220.05.2 – Contractor's responsibility	Provision for run off flows	Progressive
Excavation		
C220.07.6 Unsuitable material	Replace with backfill material	Progressive