Muswellbrook Shire Council

CONSTRUCTION SPECIFICATION

AUS-SPEC (Cot 09)

1351 Stormwater Drainage (Construction)

Version 01

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
0	No amendment has been made	all	Nil		13 June 2012

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1351 STORMWATER DRAINAGE (CONSTRUCTION)

1 SCOPE AND GENERAL

1.1 SCOPE

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

The work to be executed under this worksection consists of:

- Preparation for stormwater drainage construction.
- Temporary drainage during construction.
- Siting of pipes, pipe arches and box culverts.
- All activities and quality requirements associated with excavation and backfilling.
- All concrete work associated with stormwater drainage.

This is the general worksection applicable to all types of drainage lines, open drains, kerb and gutter, and drainage structures and shall be read in conjunction with 1352 *Pipe drainage*, 1353 *Precast box culverts*, 1354 *Drainage structures* and 1121 *Open drains, including kerb and channel gutter*, as applicable to particular Contracts.

1.2 EXTENT OF WORK

Details of the work are shown on the Drawings.

The extent of works is summarised as follows:

- Pipe culvert stormwater drainage.
- Precast box culvert stormwater drainage.
- Drainage pits, headwalls, wingwalls and aprons.
- Kerb and gutter.
- Open concrete dish drains.
- Scour protection of open drains at outlets to drainage structures.
- Demolition and removal of existing redundant pipe culverts, headwalls and pits.

1.3 QUALITY

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are given in 0161 *Quality (Construction)*.

1.4 CROSS REFERENCES

Associated worksections

Associated worksections: Conform to the following:

- *0161 Quality (Construction).*
- *0319 Minor concrete works.*
- *1102 Control of erosion and sedimentation.*
- *1112 Earthworks (Roadways).*
- *1121 Open drains, including kerb and channel gutter.*
- *1352 Pipe drainage.*
- *1353 Precast box culverts.*
- *1354 Drainage structures.*

1.5 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS1289	Methods of testing soils for engineering purposes
AS1289.5.4.1-2007	Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio

AS1289.5.7.1-2006 Soil compaction and density tests—Compaction control test—Hilf density ratio and Hilf moisture variation (Rapid method)

Other publication

NSW Department of Environment and Climate Change

Resource NSW 2003 Specification for the supply of recycled materials for pavements, earthworks and drainage.

2 CONSTRUCTION

2.1 TEMPORARY DRAINAGE DURING CONSTRUCTION

Control of erosion and sedimentation

All drainage works carried out by the Contractor shall comply with 1102 *Control of erosion and sedimentation*.

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.

Dams and diversions

The Contractor shall not dam up or divert existing watercourses (either temporarily or permanently) without the prior approval of Council.

Location of equipment

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.

2.2 SITING OF CULVERTS

Set-out

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.

Amendments to planned work

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.

Changes by contractor

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 and Council is obtained.

2.3 EXCAVATION

Topsoil

Before undertaking stormwater drainage excavation, topsoil shall be removed in accordance with 1112 *Earthworks (Roadways)*.

Trench support

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

Public Utilities

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.

Blasting

Excavation by blasting, if permitted by Council, 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 mm/sec.

Blasting operations shall comply with 1112 *Earthworks (Roadways)*.

Excavation level

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.

Unsuitable material

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 1112 *Earthworks (Roadways)* and replaced with backfill material in accordance with the requirements of this worksection and the Specifications for particular culvert types.

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.

Spoil

The excavated material shall be used in the construction of embankments backfilling or spoiled in accordance with 1112 *Earthworks (Roadways)*.

2.4 BACKFILLING

Backfilling shall be carried out in accordance with the relevant culverts or drainage structures worksections of **Scope** and compacted in accordance with **Compaction**.

2.5 COMPACTION

Foundations, bedding and backfilling

Foundations, bedding (other than for pipe drainage) and backfilling shall be compacted to the requirements of Table 2.1 when tested in accordance with AS 1289.5.4.1 for standard compactive effort.

Compaction requirements adjacent to pipe drainage for concrete, steel or flexible pipes are set out in 1352 *Pipe drainage*.

Table 2.1 Compaction of foundations, bedding and backfilling

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

Compaction layers

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

Moisture content

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% nor more than 95% of the apparent optimum moisture content, as determined by AS 1289.5.7.1 (standard compaction).

Compacting adjacent to culverts or drainage structures

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.

2.6 CONCRETE WORK

All concrete work shall comply with 0319 *Minor concrete works* in relation to the supply and placement of normal class concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection.

2.7 SPRAYED CONCRETE

If sprayed concrete has been specified, shown on the Drawings or directed by the Superintendent, it shall comply with 0319 *Minor concrete works*.

3 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in Table 3.1.

Table 3.1 Summary of Limits and Tolerances

Activity	**Limits/Tolerances**	**Worksection clause reference**
Excavation by blasting Peak particle velocity	≤ 25 mm/sec	**Excavation**
Relative Compaction (Standard)		
Foundations or trench base:		
-to a depth of 150 mm below foundation levels -material replacing unsuitable material	95% 95%	**Compaction** **Compaction**
Bedding material	95%	**Compaction**
Selected backfill and ordinary backfill material: -below 1.5 m of finished surface -within 1.5 m of finished surface	 95% 100%	**Compaction** **Compaction**
-Backfill material within the selected material zone	100%	**Compaction**
Backfill Layers Moisture content	 ≤ 150 mm > 60%, < 95%	 **Compaction** **Compaction**

4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

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

The Pay Item applicable to particular activities are listed in the worksections for these activities.

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

Erosion and sedimentation control measures are measured and paid in accordance with 1102 *Control of erosion and sedimentation*.

Topsoil removal is measured and paid in accordance with 1112 *Earthworks (Roadways)*.

Concrete work is measured and paid in accordance with the worksection for the particular drainage activities and not 0319 *Minor concrete work*s.

Sprayed concrete work is measured and paid in accordance with 0319 *Minor concrete works*.

Miscellaneous minor concrete work not included in the pay items in this worksection shall be in accordance with pay items described in 0319 *Minor concrete works*.

4.2 PAY ITEMS

1351.1 Excavation for stormwater drainage culverts and structures

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

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.

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.

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

Reinforced concrete and fibre reinforced cement pipes

Positive Projection (if excavation required)

. **Width:**

single cell: external pipe diameter + 1 m.

multi cell: sum of external diameters + sum of spacings between pipes measured square to the line of the culvert + 1 m.

Depth:

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

in embankment: average actual depth or 500 mm 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 + 1 m.

multi cell: sum of external diameters + sum of spacings between pipes measured square to the line of the culvert + 1 m.

. **Depth:**

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

in embankment: maximum 500 mm 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 +300 mm 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 500 mm 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.

Steel pipes and pipe arches

. **Width:**

wide trench: external pipe diameter or span + 2 × external pipe diameter or span.

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

. **Depth:** as for RC and FRC pipes.

. **Length:** actual excavation length.

Flexible pipes

. **Width**: For pipes of:

Ext dia at collar: external diameter of pipe plus 200 mm ≥ 75 ≤ 150

Ext. dia at collar: external diameter of pipe plus 300 mm > 150 ≤ 300

Ext. dia at collar: external diameter of pipe plus 400 mm > 300 ≤ 450

. **Depth:** average actual depth excavated.

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

Box culverts

The plan area for payment shall be the area calculated from the outside dimensions of the base slab plus 300 mm 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.

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.

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.