



ENGINEERING DESIGN &  
CONSTRUCTION CODE  
SPECIFICATION D12

**SEWERAGE DESIGN &  
CONSTRUCTION SUPPLEMENT  
TO SEWERAGE CODE OF  
AUSTRALIA WSA 02-2014**



## Amendment Record for Development and Design Manual

This Specification is Council's supplement to the WSA Sewerage Codes

Armidale Regional Council acknowledges the following documents which have been drawn upon for the creation of this document:

- SEQ WS&S D&C code. – Amendment to Sewerage Code of Australia (WSA02-2002 V2.3)
- Barwon Water – Supplementary information to the WSAA Sewerage Code Of Australia (WSA02-2002 V2.3)
- Sydney Water – Pipe Size and Grading Table
- SA Water - Supplementary Documentation to WSA 02-2002 (V2.3)
- Water Directorate - Building in the Vicinity of Sewer Mains Guidelines (2013)

Details are provided below outlining future modifications to supplement clauses.

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

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## **INTRODUCTION**

Armidale Regional Council (ARC) has adopted the Water Supply Services Association's Sewerage Code 2014 as the standard for sewerage development design and construction. This supplementary document should be read in conjunction to WSA 02 – 2014.

The WSA Code and this supporting documentation essentially provides "deemed to comply" solutions for the creation of ARC's reticulation sewer assets. ARC's input should be sought if an innovative opportunity is being considered.

The clause and table numbers given in this supplement correspond with the clause and table numbers given in the Sewerage Code of Australia, WSA 02 – 2014.

## **ACKNOWLEDGEMENT OF AUS-SPEC**

Armidale Regional Council acknowledges that the Water Services Association of Australia (WSAA) water supply and sewerage codes address requirements for planning, design and construction of water and sewerage network infrastructure. These documents together with Armidale Regional Council's Supplements will provide sufficient information to designers and planners to proceed with their developments design and construction.

Armidale Regional Council also acknowledges Aus-SPEC as a document which delivers a contract documentation system that can incorporate the water agencies requirements and the WSAA Codes technical requirements. AUS-SPEC comprises a series of standard contract documents and specifications, checklists and guidance notes which can assist contractors with their documentations on quality assurance, construction and contractual aspects. Armidale Regional Council encourages contractors, planners and designers to employ this Supplement and WSA Sewerage Code as well as Aus-SPEC documents to provide a comprehensive and high quality service.

Although, Armidale Regional Council has not identified noticeable contradiction where the two codes (WSA and Aus-Spec) overlap, this supplement plus WSA Sewerage Code shall precede all other codes and standards where the inconsistencies were noted. The designers and planners shall seek advice from the Armidale Regional Council to resolve any conflict.

## SEWERAGE DESIGN AND CONSTRUCTION D12

### PART 0: GLOSSARY OF TERMS, ABBREVIATIONS AND REFERENCES

The council	Armidale Regional Council
ARC	Armidale Regional Council
Water Agency	Armidale Regional Council

### PART 1: PLANNING AND DESIGN

#### 1.1 Scope

Replace the fourth paragraph with the following.

The Water Agency is generally responsible for overall planning for provision of sewerage to its customers. The developer's engineer is responsible for providing a concept plan and detailed design liaising with Water Agency and must obtain approval for any sewer main extension required for private development.

#### 1.2.7.3 Design Outputs

Add the item below to the list of design output to be included.

- (f) Catchment analysis and sewer flows.

#### 2.2.3 Level 2 Transportation Subsystems

DN 100 pipes are not accepted by ARC for reticulation. DN150 pipes are to be utilised for reticulation systems including property connection sewers up to and including the S-Box. Any pipe sizes above DN150 would be defined as branch or trunk sewers.

#### 2.2.4.2 Sewage Pumping Stations (SPSs)

Add the following at the end of the 1st paragraph.

Pumping sewage by SPSs through pressure mains is energy intensive, has high operation and maintenance costs, and has inherent septicity. Pressure sewer catchments that discharge septic sewage into gravity systems can cause odour problems and can reduce the life of gravity system components. Council has a clear preference for conventional gravity sewerage. Sewage pumping stations will not be permitted just to minimise the capital cost for development. The minimisation of costs of Council, ownership/maintenance and demand on energy shall be a priority. The developer/applicant shall seek prior approval from Council prior to any development proposal which includes SPSs.

Council does not permit vacuum sewerage and pressure sewerage systems. Council does not permit the installation of individual sewer pump stations in private property.

#### 2.3.1 Planning Horizon

The text in the clause is replaced with the following.

A sewer system should be planned and designed to convey the estimated peak flow from its catchment when the area has reached its maximum development, having regards to the current Armidale Regional Council Local Environment Plan zonings.

#### 2.3.4 Provision for Future Gauging Needs

Gauging is not required by ARC.



### 3.3.6 New Clause: Grading Table for Gravity Sewers

For Sewer sizes DN150 and DN225, Table 3.1 Gravity Sewer Grading may be used to design sewer pipes. For pipe sizes DN300 or larger, detailed flow estimation and hydraulic calculation is required.

Pipe Size	Grade		Minimum		Maximum	
			ETs	Flows (l/s)	ETs	Flows (l/s)
DN 150	1 in 150	0.67%	43		153	
	1 in 125	0.80%	20		170	
	1 in 100	1.00%	6		195	
	1 in 80	1.25%	1		222	
	1 in 60	1.67%	1		264	
DN 225	1 in 250	0.40%	157		407	
	1 in 200	0.50%	88		464	
	1 in 150	0.67%	34		550	
	1 in 125	0.80%	17		613	
	1 in 100	1.00%	11		699	
	1 in 80	1.25%	1		797	
	1 in 60	1.67%	1		943	

**Table 3.1 – Grading Table – Gravity Sewers Armidale**

#### 4.5 Ductile Iron Gravity Sewers

Add the following.

DI pipes are not generally used in sewer but when required for special applications, ductile iron pipe shall have a lining which has better resistance than portland cement mortar lining to hydrogen sulphide gas and sulphuric acid that may be present in sewer (TYTONXTREME ductile iron or equivalent).

#### 4.7 Polyethylene Gravity Sewers

Add the following.

PE pipes are not generally used for sewer. Prior approval from Council is required if proposed for any special application.

#### 4.9 GRP Gravity Sewers

Add the following.

GRP pipes are not generally used for sewer. Prior approval from Council is required if proposed for any special application.

#### 4.10 Plastics-Lined Concrete Gravity Sewers

Add the following.

Concrete pipes are not generally used for sewer. Prior approval from Council is required if proposed for any special application.

#### 4.11 Vitrified Clay Sewers

Add the following.

VC pipes are not permitted.

## 4.12 Steel Gravity Sewers

Add the following.

Steel pipes are not generally used for sewer. Prior approval from Council is required if proposed for any special application.

### 5.2.2 Design Accuracy

Add the following.

The Designer shall obtain sufficient survey data including but not limited to, invert levels (to AHD) at existing MHs, IOs (and connections) into which the proposed sewer(s) will discharge plus any visible and hidden obstructions affecting the design. This is to enable the Designer to prepare the design of the sewerage reticulation scheme as specified herein and to enable the design to be audited by the Council.

Any discrepancy between the measured level(s) and any recorded level(s) on plans or drawings provided by the Council, or any level which may have been provided by the Council, shall be reported to the Council for the appropriate action as soon as the discrepancy is discovered.

#### Vertical Accuracy

All levels shall be related to the Australian Height Datum (AHD) by levelling from a State Survey Marks (SSM) or Permanent Survey Mark (PSM), of at least fourth order.

A Temporary Bench Mark (TBM) shall be established from the PSM or SSM using differential levelling techniques to Class LC and Order L3 standards of accuracy as described in the Inter-Governmental Committee on Surveying and Mapping (ICSM) Publication 'Standard for the Australian Survey Control Network (SP1) Version 2.1 (2014)'. The TBM shall be placed on a permanent structure close to the starting point of each contract.

Sewer main inverts and critical design points shall also be levelled to the above accuracy and together with the levels of PSMs, SSMs and TBMs shall be shown on the Drawings to the nearest 0.001 metre. Other levels including that of boundary pegs, natural surfaces, cut and/or fill levels, existing connections, etc. taken using Electronic Distance Measurement equipment (EDM) shall be to Class D standards of accuracy and shall be shown on the Drawings to the nearest 0.01 metre.

#### Horizontal Accuracy

Horizontal measurements shall be to Class D and Order 4 standards of accuracy for Electronic Distance Measurement equipment (EDM) as described in the ICSM Publication 'Standards and Practices for Control Surveys', and shall be shown on the Drawings to the nearest 0.01 metre.

Ties to MHs, IOs, connections and occupational boundaries / existing fences within the development or adjacent to the development shall be from cadastral boundaries and shall be shown on the Drawings to the nearest 0.01 metre.

In areas remote from cadastral boundaries, MH and IO locations may be defined using MGA coordinates. Cadastral boundaries shall be pegged to the accuracy specified in the relevant Survey Act.

### 5.2.3 Sewer Layout

The fourth paragraph including the items (i) to (iv) shall be replaced with the following.

The Council's preferred location for sewer is within private property parallel to the front, rear or side boundaries of the property, to best suit the layout to service the planned and future development.

#### 5.2.4.1 General

The first sentence shall be replaced with the following.

Sewers are preferred to be located in private property.

The last sentence shall be removed as the extension of new sewer within the zone of influence of an existing structure is not permitted. Refer to clause 5.4A building near a sewer.

**5.2.4.4 Sewers Located in Small Lots (Lot Area ≤ 450 m<sup>2</sup>)**

Delete the clause.

**5.2.4.5 Sewer Servicing Industrial / Commercial Lots**

First and second sentence shall be replaced with the following.

The Council's preferred location for sewer is within private property parallel to the front, rear or side boundaries of the property, to best suit the layout to service the planned and future development.

**5.2.6.4 New Clause: Directional Drilling – Acceptance Criteria**

Horizontal directional drilling may be approved by Council subject to the following criteria:

- (a) Preferred pipe material is HDPE Material Type PE100. Mechanical or E-F couplings shall not be used in conjunction with under bore installations.
- (b) Pipe diameter to be 1 size larger than that determined by following the requirements of Section 3 and 5.
- (c) Pipe class to be minimum 2 classes higher than that determined by following the requirements of Section 3 and 4. Consulting engineers/contractors are responsible to ascertain & confirm pipe classes to suit required construction forces according to the pipe length, pipe diameter, pipe construction wear & tear and installation equipments.
- (d) Minimum grade to be the value given in Table 5.8 plus 0.5%.
- (e) The full pipe length shall be pressure tested as per Clause 21.4.
- (f) Check for ponding with water followed by CCTV inspections, ponding is not acceptable.
- (g) If there is a sag area found by CCTV, consulting engineers/contractors shall carry out a calculation to ensure that the ultimate PDWF level as designed will not exceed 75% of the pipe diameter at the sag section in depth.
- (h) If the above requirements are not met, consulting engineers/contractors shall excavate & make good or abandon the pipe and start the installation again.

Before any approvals can be granted, the consulting engineer/contractor shall agree in writing to accept the requirements of points (f), (g) & (h) above.

**5.2.8 Easements**

Add the following.

Easements shall be provided along the full alignment of any gravity sewers located in private property. Easements shall be centred over the pipe. The easement for gravity sewers up to 3m deep and up to and including 300mm diameter shall be 3m wide. Gravity mains greater than 300mm up to and including 600mm diameter and/or mains to a depth of 5m, require a 6m wide easement. For mains that are deeper than 5m or larger than 600mm diameter, the easement shall be 10m wide.

Replace Standard Drawing SEW – 1105 with ARC Standard Drawing *010-022: Property Connection Details, Sewer in Easements and Inside Property*.

**5.2.9 Disused Sewers**

Replace all the text by the following.

Where a design results in the disuse of an existing sewer, the Design Drawings and Specification shall detail proposed treatment such as demolition of top 300 mm of a MH chamber and/or capping both ends of the sewer at each MH or complete removal of the sewer and structures. Works to be undertaken on sewers and maintenance structures that are no longer required shall primarily be as advised by the Council.

The works undertaken on disused sewers and MHs shall be recorded on the Work – As –Constructed details. For disused AC pipe treatment, consult ARC.

**5.3.2 Roads, Reserves and Open Space**

Refer to ARC Standard Drawing *010-043- Buried Crossings Bored and Jacked encasing Pipe Details*.

### 5.3.8 Horizontal Curves in Sewers

Horizontal curves in Sewers are not permitted. Change in direction is allowed only through Maintenance Structures and hence all reference to horizontal curves in sewer in the code shall be disregarded.

### 5.4.4 Clearance from Structure

Delete the second paragraph.

#### 5.4.5.1 General

Add the following after the first sentence.

ARC is not part of 'Dial Before You Dig (DBYD)'. For ARC's underground services information, contact the Council directly.

### 5.4A New Clause: Building Near Sewer

#### 5.4A.1 General

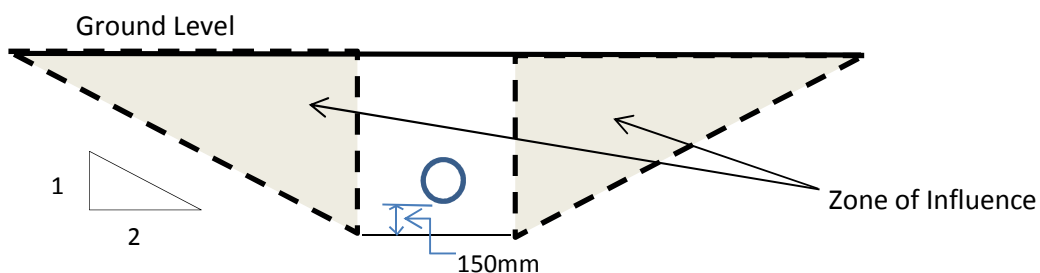
This clause applies irrespective of whether sewer is in an easement or not.

Armidales Regional Council's approach to building any structure near a sewer main is in order of preference:

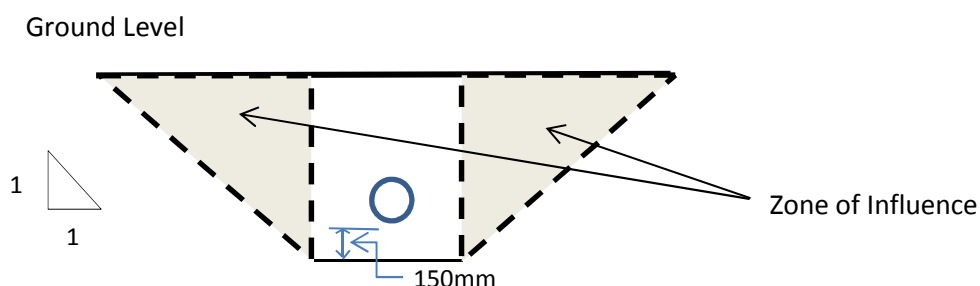
1. Relocate the proposed structure so that sewer is outside its zone of influence
2. Relocate Council's Sewer so that it is outside the zone of influence of the proposed structure
3. Allow sewer within zone of influence of proposed structure, maintaining minimum clearances and subject to additional protection measures
4. Building over sewer in an exceptional circumstance and subject to a number of conditions

Structures include but not limited to new residential/commercial/industrial buildings and their minor/major extension, garages, swimming pools, retaining walls and sheds.

The "Zone of Influence" refers to the area either side of the buried pipe where a structure may transmit a load to the pipe. The extent of zone of influence depends on the nature of the ground, ("strata"), in which the structure is located and is defined in the figure below.



**Figure 5.4A – Zone of Influence in Sand, Filled Ground, Loam**



**Figure 5.4A – Zone of Influence in Claysoil**

Minor structures such as fencing, retaining walls less than 1m high and driveways, may be allowed over the sewer without additional protection measures subject to availability of minimum cover.

Construction of a retaining wall across the sewer may be allowed if the sewer is protected by a designed bridging structure over the sewer.

#### **5.4A.2 Relocation of Proposed Structure**

Relocation of a proposed structure away from existing sewer assets is the preferred option.

#### **5.4A.3 Relocation of Sewer**

If relocation of a proposed structure is not feasible, the relocation of the sewer main is permitted at the cost of the developer. Relocated sewers shall meet all other design requirements (requirement of maintenance structures, capacity, cover, grade etc.). An easement shall also be provided over the relocated sewer.

#### **5.4A.4 Structure within the Zone of Influence**

If the two options noted in 5.4A.2 and 5.4A.3 are not practical, structures may be allowed to be built within the zone of influence subject to the following conditions

- a. Minimum horizontal clearance of 1.5m is provided. The clearance is measured from the outer wall of a footing/structure (whichever closer) to the outer wall of sewer pipe or outer-wall of maintenance structure.
- b. The footing of the structure is extended below the Zone of Influence as defined in the figure 5.4A.

#### **5.4A.5 Building over Sewer**

Council will consider construction of a structure over a sewer only in exceptional circumstances, if option 1 referred to in clause 5.4A.2 is not feasible and options 2 referred to in clause 5.4A.3 and in clause 5.4A.4 are not technically possible. The developer shall also demonstrate that all associated risks can be managed with minimum costs if building over a sewer main is to be considered. This option can only be considered for gravity reticulation sewers of 150mm size. Building over sewers larger than 150mm, any sewer contained in an easement and rising sewer of any size is not permitted. When building over a sewer is allowed, it will be subject to the following conditions.

1. Reconstruct the sewer main with new rubber ring jointed PVC or Polypropylene (SN8) pipe in its existing alignment.
2. Concrete encase the pipe with 150mm concrete (minimum N20) all around with the provision of designed reinforcement in accordance with WSA figure. The encasement shall extend past the building/structure an equivalent distance to the depth of the main below ground level.
3. Provide short 600mm stub lengths on either side of the concrete encasement to provide articulation to accommodate for differential movement and eliminate bending stresses.
4. Provide suitable maintenance structures on either side of the encased sewer
5. Foundations within the zone of influence will require piercing to a minimum depth below the invert of the affected sewer or until solid rock is encountered. A minimum horizontal clearance of 1 metre is required between any piers and the sewer main.

#### **5.4A.6 Existing Encumbrances**

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

Where it is necessary to access an underground sewer main 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 built over a sewer main with council approval, no further extensions, additions or reconstructions will be permitted without further assessment.

### 5.5.4 Minimum Pipe Sizes for Maintenance Purposes

Table 5.5 replaced with the following.

Sewer	Minimum size DN
- Property connection sewer servicing 1 residential lot or more up to and including S-Box	150
- Property connection sewer servicing commercial and industrial lots	
- Reticulation sewers servicing residential lots	

**Table 5.5 – Minimum Pipe Sizes for Reticulation and Property Connection Sewers**

### 5.5.5 Maximum ET for Reticulation Sewers

Table 5.6 modified to include Maximum ETs for Armidale.

	I1,2 #	mm/h	Armidale*
	Grade		24.4
DN 150	1 in 175	0.57%	139
	1 in 150	0.67%	153
	1 in 125	0.80%	170
	1 in 100	1.00%	195
	1 in 80	1.25%	222
	1 in 60	1.67%	264
DN 225	1 in 300	0.33%	365
	1 in 250	0.40%	407
	1 in 200	0.50%	464
	1 in 150	0.67%	550
	1 in 125	0.80%	613
	1 in 100	1.00%	699
	1 in 80	1.25%	797
	1 in 60	1.67%	943

# I 1,2 is 1 hour rainfall intensity on an average ARI of 2 years.

\*Maximum ET for Armidale was calculated by linear interpolation between values given for Dubbo and Canberra in WSA 02 -2014 Table 5.6

**Table 5.6 – Maximum Capacities for Gravity Sewers for Armidale**

#### 5.5.7.1 General

Table 5.8 modified as follows.

Pipe Sizes DN	Design minimum grade %
Reticulation	
150	0.65
225	0.40
300	0.30

**Table 5.8 – Design Minimum Grades**

#### 5.5.7.3 Property Connection Sewers and End-of-Line Sewers

Delete reference to DN 100 property connection sewer in the Table 5.9, this is not permitted.

### 5.6.2 Long Section Design Plan

The existing clause is revised as follows.

The vertical alignment of sewers shall be shown on longitudinal sections in the Design Drawings. The longitudinal section shall nominate all relevant levels along the length of the proposed sewer at typically 20m intervals. Spacing may be increased where the terrain grade is consistent.

In addition, levels shall also be provided for the following locations:

- (a) At each side of any road crossing.
- (b) At crossings of existing and proposed creeks, drains, cables and other pipes or services.
- (c) At changes in grade including at maintenance structures and vertical bends.
- (d) At regular intervals on vertical curves so that the sewer depth is within minimum and maximum limits below FSL.

### 5.6.3 Minimum Cover over Sewers

Table 5.11 replaced with the following.

Location	Minimum Cover to top of Sewer mm
Private residential property and public land not subject to vehicular loading	750
Private residential property subject to vehicular loading	750
Footways, nature strips, industrial property, sealed road pavements other than arterial roads subject to vehicular loading	900
Unsealed road carriageways	1200
Arterial road carriageways	1200
Future road, rail and tram pavement	1200

**Table 5.11 – Minimum Cover over Sewers**

#### 5.6.4.4 Partial Lot Service

Delete item (ii): pump to the property connection fitting

Pressure or Vacuum sewerage schemes are not permitted.

Suitable restrictions on the title of the lot which can only be partially-serviced are required so that future owners are aware of the constraint.

#### 5.6.5.2 Soffit Requirements

Add the following at the end of the last paragraph.

Alternative means such as pumping systems and reflux valves are not permitted.

#### 5.6.7 Vertical Curves

Vertical curves are not permitted.

#### 5.6.8 Compound Curves

Compound curves are not permitted.

## 6.2 Limitations of Connection to Sewers

Replace the first sentence with the following.

Lots shall not be connected to sewers  $\geq$  DN 300 unless suitable inlets have been provided at a MH at the time of sewer construction.

### 6.3.1 General

Replace the clause with the following.

The reticulation sewer or property connection sewer shall provide a point of connection for each customer sanitary drain. Inspection opening (IO) interface method (refer to clause 6.3.2 and replace Figure 6.1 with Council's Standard DWG. 010-047 and 010-048) shall be adopted.

### 6.3.2 IO Interface Method

Replace the clause with the following.

For the IO interface method, the reticulation sewer main, shall be laid in private property and a property connection sewer constructed, to provide a point of connection for the customer sanitary drain. An IO shall be installed and capped by the developer. All components from the main to and including the riser shall be DN150 SN8 and Rubber Ring Jointed. The end of the junction to the main or a property sewer extension into the property (refer to ARC Standard Drawings) defines the end of the responsibility of the Water Agency. The customer is responsible for providing the sanitary drain upstream of the IO in accordance with AS/NZS 3500.2.2. The customer is responsible for the ongoing maintenance of the property connection from the nominated point of Water Agency responsibility including the IO riser cover.

### 6.3.3 Buried Interface Method

This clause is deleted.

### 6.5.2 Vacant Lots

Amend item (a) as follows.

(a) 2m from side boundary when the sewer main is in the rear side and when the sewer main is in the front, either in the road reserve or in private property, 5m from the side boundary unless the position of the driveway is known, in which case the property connection sewer shall be located clear of the driveway; and

### 6.6.2 'Type 7 Spur' or 'Y' – Property Sewer Connections

Not permitted.

## 7.1 Types of Maintenance Structures

Amend clause.

Item (d) Terminal maintenance shafts (TMSs) and Item (e) Inspection shafts (ISs) are not allowed in Council's sewer system.

## 7.2 Locations of Maintenance Structures

Amend item (c) and (e),

(c) Changes of sewer direction.

(e) Combined changes of sewer direction and grade.



## 7.3.1 General

Table 7.1 modified as follows,

Application	Acceptable Options 1			
	MH	MC	MS	TMS
Intersection of reticulation sewers— ≤2 inlets at same level	YES	NO	NO	NO
Intersection of reticulation sewers— ≤3 inlets at any level	YES	NO	NO	NO
Reticulation sewers / change of grade at same level	YES	Yes Subject to factory installed connections provided on the MC base	YES for DN150 only and using vertical bend only.	NO
Change of grade at different level	YES – MH with internal/external drops	NO	NO	NO
Change in sewer size	YES – MH is the only option	NO	NO	NO
Change in sewer horizontal direction	YES – within permissible deflection at MH	YES 2	YES 2	
Change of pipe material	YES	NO	NO	NO
Permanent end of a reticulation sewer	YES	YES	YES	NO 3
Permanent end of a property connection sewer	NO	Not applicable		
Sewer pressure main discharge point	YES – MH is the only option and must include a vent	No	NO	NO
Junction of reticulation sewer and property connection sewer— same size sewers	YES	YES Maximum 2 high level inlets into shaft		

## NOTES:

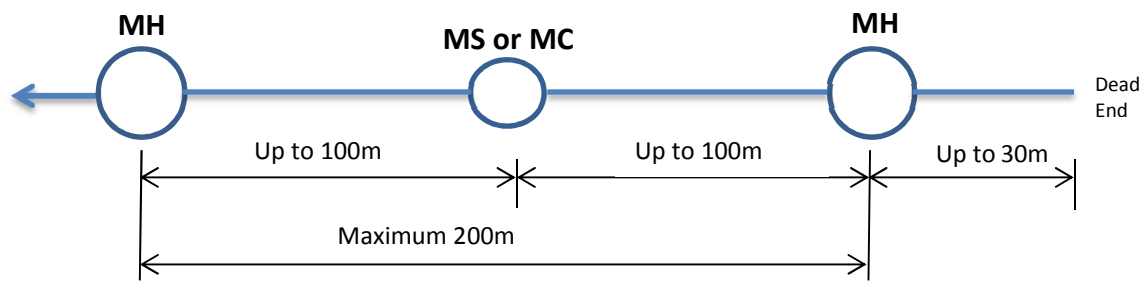
1. Where personnel entry is required down to the level of the sewer, a MH is the only option.
2. MS prefabricated units may be considered for horizontal change of direction – Maximum deflection 30° subject to Water Agency approval.
3. End cap only required at dead end sewer.

**Table 7.1 – Acceptable MH, MS and TMS Options for Reticulation Sewers**

## 7.3.2 Maintenance Structure Spacing – Reticulation Sewers

For reticulation sewers (DN150) the maximum distance between any two consecutive maintenance structures shall be 100m and subject to the provisions of clause 7.3.1. The maintenance spacing of MH's shall not be more than 200m irrespective of intermediate MSs/MCs. The distance from the last maintenance structure to the end of line or dead end shall not be more than 30m. Dead ends are to be capped with a proprietary cap.

Figure 7.1 modified as follows,



**Figure 7.1 – MH and MS or MC Spacing and Distance to Dead Ends**

### 7.3.3 Maintenance Structure Spacing – Branch and Trunk Sewers

Replace the text in the clause with the following.

Only MHs shall be used for branch and trunk sewers of sizes DN 225 and greater. The maximum distance between any two MHs shall be 120 m.

### 7.4 Special Considerations for Location of Maintenance Structures

Add the following.

Maintenance Structures below the 1% AEP flood level, including in any overland flowpath, shall have water tight lids.

### 7.6.2 Types of MH Construction

Add the following.

MH's constructed in GRP, PP and PE are not permitted.

### 7.6.7 Diameters of MHs

Amend the first paragraph as follows.

The standard internal diameter for MHs is 1050 mm. The range of sizes preferred by most Water Agencies is 1050mm, 1200mm and 1500mm nominal internal diameter. Reduced sizes are not permitted even for shallow sewers.

### 7.7.1 General

The clause is to be replaced with the following.

MCs or MSs may be used on DN150 sewers as an alternative to some MHs (refer to Table 7.1 and Standard Drawings 010-035, 010-036). MCs or MSs are manufactured with a range of inbuilt horizontal deflections ( $0^\circ - 90^\circ$ ). Refer to Table 7.1 for allowable deflection. The use of horizontal and vertical bends is not permitted.

### 7.7.2 Design Parameters for MCs and MSs

The clause shall be re-written as follows.

MCs or MSs shall only be used at the design locations detailed in Table 7.1. Directional and gradient changes at MSs shall be achieved by MC or MS units specially manufactured for specific horizontal angles to suit design requirements. An MC or MS shall incorporate not more than one higher-level incoming reticulation sewer.

MCs or MSs shall not be used at discharge points of sewer pressure mains (refer to Clause 5.6.4.4 and 5.6.4.5). The depth of MSs shall be limited as appropriate to:

- (i) The maximum depth authorised by the Water Agency;
- (ii) The minimum depth required for adequate cover and physical height of the MS unit; and
- (iii) The MSs manufacturer's maximum allowable depth limit.

The deviation from vertical of an MS riser shaft shall be kept within a vertical plane passing through the sewer axis and shall not exceed 1:10 (horizontal: vertical), or a maximum of 300mm at the surface whichever is the lesser. Notwithstanding, where reticulation sewers and/or property connection sewers discharge directly into a riser shaft, the riser shaft shall be vertical with the tolerance on verticality being specified in the Design drawings such that the grade of the incoming sewer is within design tolerance.

In deep or steep sewers, a special compensatory bend shall be installed on the riser immediately above the MS base fitting to correct verticality of the riser shaft to within the specified verticality limit. Within the tolerance on verticality, a riser shaft shall be aligned such that the shaft is as perpendicular as practicable to finished ground surface.

### **7.7.3 Connections to PE MSs and TMSs**

Add the following.

MCs or MSs shall incorporate not more than two high-level property connection sewers entering radially into the riser shaft. For two such property connections, each property connection sewer shall be connected at a different level.

Where a property connection is required directly ahead of the permanent end of the sewer e.g. connection at the end of a cul-de-sac, the sewer main shall be extended minimum 1m past the property connection point and end capped.

## **8.2 Water Seals, Boundary Traps, Water-Sealed MHs and Gas Check**

Add the following as a first sentence.

Water seals, boundary traps, water-sealed MHs and Gas Check are not generally required.

### **8.3 Vertical and Near Vertical Sewers**

Vertical and near vertical sewers are not generally permitted and prior approval from Council is required if there is no other alternative.

#### **8.6.2 Design Parameters for Inverted Syphons**

Insert the following as a first sentence.

Inverted Syphons are not generally permitted.

Amend the item (ix) as follows.

(ix) The inlet structure shall be designed so that only the primary barrel comes into operation for flows up to PDWF (with a provision of freeboard) and the secondary barrels are brought into service for increased flows i.e. PWWF.

## **9.2 Product and Material**

Add the following.

ARC accepts rubber ring jointed PVC pipes for sewers. Vitrified Clay pipes (VC) are not permitted. ARC's approval is required for use of other materials for pipes and fittings.

**9.8A New Clause: Creek Crossing**

Where approved by ARC, sewers shall be designed such that any sewer crossing a creek shall be located below the creek bed. This requirement will provide a critical control point in the network layout design. However, where this requirement cannot be met the sewer shall be located above the Q100 flood level (i.e. aerial crossings or bridge crossings). If this cannot be achieved and the aerial crossing sewer is located below the Q100 flood level, the sewer crossing design is to be accompanied by a certificate of structural adequacy prepared by a qualified structural/civil engineer stating that the crossing has been designed to withstand structural damage from the forces of floodwaters and associated debris.

For creek crossings, the designer shall obtain the approval of the relevant authority responsible for management of the waterway and/or relevant road authorities.

**10.2.3 Scale**

Preferred scales are 1:500 or 1:1000 for detail plans and the horizontal component of longitudinal sections. Preferred scales for the vertical component sections are 1:50 or 1:100 (10:1 distortion).

**10.2.5 Sewers**

Amend the item (k) as follows.

(k) Detectable tape is to be laid 600mm above the main.

**10.2.6 Structures**

Amend the item (h) as follows.

(h) MGA co-ordinate if available

**10.5 Recording of As-Constructed Information**

The Supervising engineer shall arrange for a registered surveyor to carry out, the As-constructed survey checks, record all variances and certify that the As-constructed information and Drawings are correct. Work-as-constructed plans shall be submitted to the Council in PDF format, the pdf file shall be a plot of actual size, metric and 600 DPI. A hard copy shall be provided on paper as well, with both the electronic and hard copy to include a certification by the Supervising Engineer and the Surveyor.

Asset attribute data is to be captured for all assets created. Data is to be presented in a spreadsheet.

Work As Constructed plans shall show items below,

- (a) Cadastral information including streets, street names, lot boundaries and numbers and easement locations;
- (b) Sewer main diameter (DN), material type, pressure class (PN), series (PVC), joint types;
- (c) Maintenance Structure and line numbers, material type and class (numbers for sewer line and maintenance structures are assigned by Council's utility network officer);
- (d) Sewer main location (offset) from property boundary;
- (e) Redundant mains;
- (f) ARC's Development Application number;
- (g) Location and depth of sewer service connections; and,
- (h) Longitudinal sections with as-constructed invert levels, surface levels, depth to inverts and pipe grades.

The pdf file shall be a plot of actual size, metric and 600 DPI. Both hard copy and electronic versions are to include a certification stamp.

## APPENDIX C FLOW ESTIMATION FOR UNDERDEVELOPED AREAS

The following values for different factors should be used when using the method contained in Appendix C to work out design flows for undeveloped areas.

Armidale average dry weather flow (ADWF) = 200 L/d/EP (0.0023L/s/EP).

Leakage Severity Coefficient:

Soil aspect, S aspect = 0.4 based on relatively low expansive clays in Armidale that sewer mains are likely to be laid in.

Network defects and inflow aspect, N aspect = 0.4 for new mains in outer sewer catchment areas  
0.6 for the remainder of the sewer catchment

Leakage Severity Coefficient C = S aspect + N aspect = 0.8 for new mains in outer sewer catchment areas  
1 for the remainder of the sewer catchment

Approximate Values of (I1,2) for ARC = 24.4 mm/hr

Containment Factor, Factor containment = 1.3 which corresponds to 5 year ARI

When calculating Groundwater infiltration (GWI), Portion wet = 0.1 should be taken as a minimum value where the sewer is typically less than 1.5m deep and where the ground water table depth is unknown.

## PART 2: CONSTRUCTION

### 12.2 Order of Construction

Amend item (e) as follows.

(e) Connect to the live sewer after all other works have been constructed as specified. Connection to live sewers may only be undertaken by Council staff or by approved subcontractors under the supervision of Council. Approval for connection to live sewers shall be obtained from Manager of Water and Sewer services before works commences.

#### 12.5.1 Protection of Other Services

Add the following at the end of the first paragraph.

ARC is not part of Dial Before You Dig services. Contact ARC directly to obtain information on Council's underground services.

The contractor shall be responsible for any damage they cause to existing underground services. If the contractor damages any existing services, it shall arrange for the relevant service authority to make good such damage and the cost thereof shall be borne by the contractor. If in the opinion of the Council, the failure or damage causes an emergency situation, then remedial action will be taken by the Council and the full cost of such action shall be borne by the contractor.

Amend item (c) as follows,

(c) As appropriate for critical services, arrange for a representative from the service Owner to be present, unless the service Owner directs otherwise. Any water or sewer mains in close proximity of the works that maybe affected by the works must have their location and depth confirmed by non-destructive pot holing such as hand digging or vacuum pot holing. A Council representative shall be present for water or sewer mains greater than DN150.

#### 12.5.4.3 Protection of Adjacent Lands and Vegetation

Add the following.

Only remove or trim trees that have been identified in an approved plan for removal/trimming.

Record a video of the pre-construction condition of the site to be utilised in the restoration phase.

### 12.6 Disused Sewers

See also Clause 5.2.9 of this document.

### 13.1 Authorised Products and Materials

See also Section 4.

### 13.4 Concrete Works

Add the following.

Form work may be removed typically after 48hours. For deep construction additional curing time will be required. Typically for,

- i) Up to 3m – 48 hours
- ii) 3m to 6m – 72hours
- iii) 6m to 9m – 5days

Back filling will be permitted 72 hours after placement of concrete for structures up to 3m deep. For structures deeper than 3m, backfilling shall not commence until 7 days after concrete placement.

Super imposed loads are not to be applied to the structure until the concrete has achieved a minimum of 85% of design concrete strength.

All concrete surfaces shall be covered with plastic, canvas or hessian sheets for 7 days or a minimum 72 hours where specific need requires and it is approved by the supervising engineer. Temperature extremes should be considered when specifying the concrete curing process.

**14.11 Surplus Excavated Material**

Add the following.

Refer to current DECCW regulation with respect to testing for contamination before disposal of wastes offsite.

**16.2.2 Methods of Deflection**

Deflection of sewers are not permitted.

**16.2.3 Horizontal Curves**

Horizontal curves are not permitted.

**16.2.4 Vertical Curves**

Vertical curves are not permitted.

**16.2.5 Compound Curves**

Compound curves are not permitted.

**16.8 Dead Ends**

Reference: Standard Drawings 010-024.

**16.11 Markers**

See also clause 10.2.5 item (k) of this document.

**17.3 Glass Reinforced Plastics (GRP) MHs**

GRP MHs are not permitted.

**17.4 Polyethylene (PE) MHs**

PE MHs are not permitted.

**17.5 Polypropylene (PP) MHs**

PP MHs are not permitted.

## 19.2 Embedment Material

Crushed rock dust or clean sand with grading specified in AS 2566.2 – Appendix G: Table G3 (extract copied below) shall be used for embedment materials.

Sieve size (mm)	Mass of sample passing, percent	
	Crushed rock dust	Sand
9.5	100	-
6.7	85-100	-
4.75	-	100
2.36	0-20	100-90
1.18	-	85-100
0.60	-	70-100
0.30	-	50-100
0.15	-	0-40
0.075	0-2	0-5

Extract of Table G3 in AS 2566.2 – Appendix G

### 19.3.2 Compaction Trials / Pre-qualification of Embedment Compaction

Remove the clause, alternative to embedment compaction testing is not permitted.

#### 20.1.2.1 Trafficable Areas

Amend item (a) as below.

The full width of any existing or proposed road reserve including carriageway, footpath and verge.

### 21.1 Acceptance Testing: General

Add the following for acceptance testing.

1A Straightness of Alignment Testing

#### 21.2A New Clause: Straightness of Alignment Testing

Place a torch or other light source at one end of a section of sewer main and a mirror at the other end. The full circle of the light must be seen to confirm straightness of the main.

### 21.3.1 Compaction Testing: General

Add the following.

The contractor (or the consulting engineer of the development works) shall be responsible for all compaction testing and shall arrange for the testing to be carried out by a NATA certified Test Laboratory.

Prior to commencing works the Contractor / consulting engineer shall prepare a test plan showing the number of tests and depth in each zone where testing is to be carried out.

The Test Laboratory shall randomly select test locations in each zone. The relevant authority may direct the Test Laboratory to undertake additional tests in any zone. The test locations shall be uniformly spread over the works.

#### 21.3.3.1 Embedment Compaction Testing: Applicable Pipe Sizes

Embedment testing is required for all size mains. Clause 19.3.2 does not apply.

Note: Type 3 support requires non-cohesive embedment material. Cohesive graded sands and gravels may be authorised by the Water Agency. Refer to Standard Drawings 010-37 and 010-038.



**21.3.4.4 Frequency and Location of Tests**

Add the following.

Testing shall not be clustered within a zone or at boundaries of a zone.

In deep trenches where more than 1 layer is to be tested, the test locations shall where practicable, be staggered from those layers above or below by at least 5m for sewers and pressure mains and 2m for property connection sewers.

**21.4.5.1 Testing of Concrete MHS: General**

Replace the clause with the following.

A vacuum test or hydrostatic test shall be carried to test all concrete MHs.

**22.4.5.2 Test Method**

Add the following.

An alternative test method is the hydrostatic test method. For a hydrostatic test, fill MH with water and allow 24 hour period for absorption. Measure drop in water in a 30 minute period from bottom of cover recess to chamber cover surround. The test is satisfactory if the drop does not exceed 3mm per metre depth of access chamber measured from the bottom of recess in the cover surround to the outlet invert.

Delete the Table 21.4.

**21.8 Internal Inspection**

Add the following.

Internal inspection by CCTV camera shall be carried out by the Council at the developer's cost.

**23 Connection to Existing Sewers**

Also see Clause 7.5 of this document.

**24.1 Restoration: General**

Add the following at end of clause.

The following Seed Mixtures shall be used for restoration when required.

"Footpath mix" seed (30% Perennial Rye grass HE, 30% Creeping red fescue HE, 30% Spider fescue HE, 10% Bermuda couch) shall generally be used in the locations specified below:

- Passive parks and reserves
- Active parks (sports fields)
- Lawns
- Footpath areas where there is no risk of invasion into adjacent "designer turf" lawns
- Drainage channels
- Embankments
- Excavations

HE refers to 'High endophyte' seed.

Where there is a risk of invasion into residential properties that have "designer lawns", "Speedy Green" turf mix (33% Perennial rye grass HE, 33% creeping red fescue HE, 33% Spider fescue HE) shall be used.

**24.2 Pavements**

The Clause is revised as follows.

At the completion of backfilling of a trench excavation through a road pavement, restore the pavement to a trafficable condition. Council prefers all underground utility service road crossings of formed public roads to be under road bored unless existing services prohibit this form of construction. Justification for road crossings by open trenching should be provided to seek approval. Any such trenched road crossing must be reinstated in accordance with the ARC Engineering Code. Road crossing utility trenches are to be sealed within 24 hours. Where an AC seal is required to match the existing road pavement, a temporary seal flush with the adjacent pavement may be applied in the first 24 hours and the permanent AC seal within 14days. A minimum of 40mm of AC shall be installed in the resurfaced trench.

Maintain temporary restoration until final restoration is carried out. Carry out final restoration of the pavement to restore both pavement and sub-base to no less than their pre-existing condition or as specified in design drawings. If appropriate, remove temporary restoration when carrying out final restoration work.

**24.8 New Clause: Concrete Footpaths, Driveways, Kerbs and Gutters**

Reinstate all concrete footpaths, driveways and kerb and gutters in accordance with the ARC Engineering Code.

**25 Work As Constructed Details**

Prepare Work As Constructed drawings and documentation to the requirements of the Water Agency and submit it with all relevant documentation to have the new installation accepted on to the 12 months defects liability period. Work-as-executed plans shall be certified by the Supervisor Engineer.

## APPENDIX I: ARC STANDARD DRAWINGS

- 010-019 Typical Gravity Sewer Design Layout
- 010-020 Property Connection Details Sewer in Easements and Inside Property
- 010-021 Property Connection Details Sewer in Road Reserve
- 010-022 Sewer System Ownership Legacy Installations with Boundary Trap
- 010-023 Sewer System Ownership with S-Box
- 010-024 Typical Pipe Laying Arrangement
- 010-025 Maintenance Holes Sewers Less or Equal to DN 300 Typical Channel Arrangements
- 010-026 (1-3) Sewer Maintenance Holes Manhole Bases and Pipe Connection Details
- 010-027 Sewer Maintenance Holes Connection Details DN 110 to DN 450 PE Pipe
- 010-028 (1-2) Maintenance Holes External and Internal Drops Through MH
- 010-029 Precast Sewer Maintenance Holes Sewers Less or Equal to DN 300 Depth Less or Equal to 1200 and 1200-6000
- 010-030 Sewer Maintenance Holes Depth to Invert 6m to 15m
- 010-031 Sewer Maintenance Holes Depth to Invert Greater than 15m
- 010-032 Sewer Maintenance Holes Sewers DN 375 to DN 750
- 010-033 Sewer Maintenance Holes Permanent Formwork Equal to or Greater than DN 375
- 010-034 Sewer Maintenance Holes Step Irons and Ladders
- 010-035 Sewer Maintenance Shafts Typical Installation
- 010-036 Sewer Maintenance Shafts and Chambers Typical MS and MC Cover Arrangements
- 010-037 Sewer Main Embedment and Trench Fill Typical Arrangement
- 010-038 Standard Sewer Trench Details
- 010-039 Sewer Trench Drainage Bulkheads and Trenchstops
- 010-040 Sewer Trench Drainage Typical Systems
- 010-041 Buried Sewer Crossing Roadways
- 010-042 Buried Sewer Crossings Railways
- 010-043 Buried Sewer Crossings Bored and Jacked Encasing Pipe Details
- 010-044 Sewer Aerial Crossings Aqueduct
- 010-045 Sewer Aerial Crossings Aqueduct Protection Grille
- 010-046 Aerial Crossings Bridge Crossing Concepts
- 010-047 Property Sewer Connection Details IO Interface Method Less than 1200 Deep
- 010-048 Property Sewer Connection Details IO Interface Method Greater than 1200 Deep
- 010-049 Property Sewer Connection Details Around Obstructions

**ATTACHMENT 1: ARC INSPECTION AND TEST PLAN – SEWER RETICULATION MAIN LAYING**

June 2017

D12-28

Armidale Regional Council

SEWERAGE DESIGN AND CONSTRUCTION

<b>Developer:</b>		<b>Superintendent Representative (SI R) :</b>		<b>Certifying Engineer:</b>				
		<b>Constructor:</b>		<b>Constructor Site Representative:</b>				
<b>Case No:</b>		<b>Sub-contractor:</b>		<b>Witness, Hold &amp; Surveillance points added to ITP</b>				
<b>Works classification:</b>		<b>Field Tester:</b>						
<b>Works description:</b>		<b>ITP Prepared by:</b> Date / /		<b>Reviewed by:</b> Date / /		<b>ARC Representative:</b> Date / /		
No	Construction/Inspection Activity	Inspection Procedure & Acceptance Criteria		Constructor	SI R**	ADC*	Record	Comment
1	Prestart/Site establish	Visual check.		X	H	S	Checklist	
2	Approved materials on Site and delivered	Visual check approved materials. Quantity and condition. Checklist completed.		X	H	S	Checklist	
3	Accredited personnel on site	Check Accreditation		X	H	S	Checklist	
4	Excavation and pipe laying (including sidelines and IO's)	Visual and dimensional check to ARC's Standards. Checklist completed.		X	W	S	Checklist	
5	Maintenance Holes, Maintenance Shafts	Visual and dimensional check to ARC Standards. Checklist completed.		X	W	S	Checklist	
6	Embedment and Trench Fill	Visual check of alignments and compaction testing to ARC's Standards		X	H	S	Checklist, Compaction Test Results	
7	Surface Fittings	Visual and dimension check to ARC's Standards		X	H	S	Checklist	
8	Survey of PCS (to be done by constructor)	Survey of pipe location before backfill		H	S	S	Checklist	
9	Survey of sewer in easement if applicable	Survey of pipe location before backfill		H	H	S	Checklist	
10	WAE survey of Structures (MH/MS) and invert levels	WAE survey		W	H	S	Checklist	
11	Testing	Pressure/vacuum/hydrostatic, embedment, compaction and infiltration testing tests to ARC's Standards. CCTV of main sewers		X	W	S	Test Results	
12	Pre-Connection Inspection – Main	Visual inspection to ARC's standards Flow Management procedures		H	H	H	WAC. Sewer Main Connection Report	

13	Connection to System	Visual and dimensional check to ARC's Standards		X	X	H	Sewer Main Connection Report
14	Restoration	Visual inspection against photographs. Clearance letter from Council/property owner		X	W	S	Clearance letter
15	Validation	<b>No</b>	<b>Amendment</b>	<b>Date</b>	<b>Reviewed</b>	<b>Symb ol</b>	<b>Legend</b>
I certify that the works have been constructed in accordance with ARC's Standards and the Inspection and Test Plan.  Superintendents Date / /						<b>X</b>	Inspection by
						<b>H</b>	Mandatory Hold Point
						<b>W</b>	Option given to inspect
						<b>S</b>	Surveillance

\* ARC reserves the right to vary these requirements at any time \*\*ARC's written approval MUST be obtained prior to varying these requirement

## SEWER CONSTRUCTION CHECKLIST

\* Clause and Drawing No. refer to the Sewerage Code of Australia WSA 02-2002-2.3 And ARC's Supplement

# Refer to Provider Instructions

Case Number:		Main layer Name:				
Location:		Pipe Size:				
		Line No:				
SI R:		Chainage Laid:				
No	Description	Date:				
		Minimum Standard				
1.1	Photographic record	#, *CI 13.4.1				
1.2	Council fees paid including road opening	Council requirements				
1.3	Property entry agreement	#, *CI 13.5.5/13.6				
1.4	Current plan on site	#, SI to confirm, *CI 13.1				
1.5	Current main laying Specification on site (Sewerage Code of Australia WSA 02-2002-2.3 & ARC's supplement)	#, SI to confirm, *CI 13.1				
1.6	Maintenance structure final levels on site	#				
1.7	Accredited main layer on site	#, * CI 12.2				
1.8	Safe Work Plan on site & implemented	#, SI to confirm, *CI 13.5				
1.9	Environmental Management Plan on site & implemented	#, SI to confirm, *CI 13.5.6				
1.10	Inspection and Test Plan on site – one working copy	#, SI to confirm				
1.11	Traffic Management Plan on site & implemented	Industry practice, *CI 13.5.4.2				
1.12	Survey pegs in place	#, Registered Surveyor				
1.13	Job set out/level sheets	#, SI to confirm				
1.14	Finished Surface Levels and Invert levels	# SI to confirm invert levels, Constructor to follow notes on plan for surface levels				
1.15	Services authorities contacted – 48 hours' notice	Design plan				
2.1	Approved materials on site	*CI 14.4				
2.2	Delivery Inspection	*CI 14.4				
2.3	Pipe type and size to current plan	Current Plan				
2.4	Marking tape	* CI 17.11.1				

## SEWER CONSTRUCTION CHECKLIST

\* Clause and Drawing No. refer to the  
Sewerage Code of Australia  
WSA 02-2002-2.3 And  
ARC's Supplement

# Refer to Provider Instructions

2.5	Bedding material	* 010-037 * CI 20.2						
2.6	Trench fill	* 010-037 * CI 21.1						
2.7	Fittings	As per design Plan						
2.8	Surface Fittings	Only ARC approved products to be used, ARC's Supplement						
2.9	Cast in situ chamber formwork	SI/SI R to confirm, *CI. 14.5.3.1						
2.10	Maintenance Shafts	LI 4.4						
2.11	Pipe laying accessories	WSA-01-2004-3.1 Clause 2.12						
2.12	Products for structural MH's on site (external waterstop, lining product, hydrophilic water seals)	As per specifications on design plans						
3.1	Accredited personnel on site	Accreditation to ARC's Supplements						
4.1	Services marked	Dial Before You Dig, Contact ARC directly for ARC's services, *CI 13.5.2						
4.2	Services exposed	*CI 13.5.2						
4.3	Trench width to standard	*Design Drawing						
4.4	Trench depth to design level	*Design Drawings						
4.5	Shoring (S) Benching (BN) Battering (BT)	*CI 15.1/15.6						
4.6	Bulkheads & trench drainage	*010-039, 010-040 and Cl. 15.7						
4.7	Pipe embedment (bedding, surround & overlay) to standard	*010-037, *CI 20.2						
4.8	Embedment – single size material (if applicable) for deeper sewer sections)	As per design plan						
4.9	Pipe laid to grade (note variation)	*CI 17 and Cl. 23						
4.10	Concrete encasement to standard (CH-CH)	*CI 14.5						
4.11	Property Connection Sewer to standard including IO	ARC's standard drawings						
5.1	Maintenance Shafts to Standard	*CI. 6.7						
5.3	MH to Standard	*Cl. 6.6 and Design drawings						

## SEWER CONSTRUCTION CHECKLIST

\* Clause and Drawing No. refer to the  
Sewerage Code of Australia  
WSA 02-2002-2.3 And  
ARC's Supplement

# Refer to Provider Instructions

5.4	External Drops	Design drawings						
6.1	Embedment: Approved material only	*010-037, 010-038, *CI 20.1						
6.2	Trenchfill: Approved material only & layered	*010-037, 010-038, *CI 21.1						
6.3	Compaction to standard: Wheel (W) Other (O)	*CI 21.1.3						
6.4	Barricades, fencing, trench plates in place & secured	OH&S						
7.1	Surface Fittings	Relevant standards						
8.1	Constructor to record chainage of PCS junction, length and type of PCS, length to IO and invert level of PCP	As per note on plan						
9.1	Survey of main in easement	Receive plans from Surveyor						
10.1	WAE Survey of Main and Structures	Receive Plans / from Surveyor						
11.1	Visual inspection of 100% of sewers, maintenance structures and PCS's	ARC's standard drawing and design plan						
11.2	Embedment Testing (compaction)	*CI.20.3						
11.3	Trenchfill Testing (compaction)	*CI. 22.3						
11.4	Vacuum/pressure testing of 100% of sewer	*CI. 22.4						
11.5	Deflection Testing of Sewer (20% of deepest section)	*CI. 22.6						
11.6	CCTV of the entire sewer incl. PCS's	*CI 22.7						
12.1	Work-As-Constructed compiled with connection assumed	#, *CI 23/26						
12.2	Pre connection inspection, Procedures and plans to address special conditions are in place i.e. Flow Management Plan	# Flow Management Plan						
13.1	Connection Safe Work Plan on site & implemented	#, SI to confirm						
13.2	Connection to live sewer – cut in junction	As per ARC's standard drawings						
13.3	Connection to live sewer – existing MH/MS	*010-026-SHT 1-3						
13.4	Connection to live sewer – build MH/MS over existing line	*010-026-SHT 1-3						
13.5	Straight connection to existing end	As per design						
14.1	Site cleared & restored	*CI 13.5.4/25						



**SEWER CONSTRUCTION CHECKLIST**

\* **Clause and Drawing No. refer to the Sewerage Code of Australia WSA 02-2002-2.3 And ARC's Supplement**

**# Refer to Provider Instructions**

15.1	Validation	#						
15.2	Inspection & test plan signed off	#						
This is to certify that excavation & installation of sewer mains & chambers has been in compliance with ARC's Standards and in accordance with Company OHS & Environmental Policies.		Signed: ..... Date:..... (Accredited main layer responsible for construction)						

## ATTACHMENT 2: DOCUMENT IMPROVEMENT REQUEST

<b>Document Improvement Request</b>			
<b>ARC's Supplementary Manual to WSA 02 – 2014 Version 3.1</b>			
<b>From:</b> Name:			
Position/Title:			
Section/Company:			
Address:			
Email:		Phone:	
Signature:		Date	
<b>To:</b> Manager Water Services, Armidale Regional Council			
Email: Council@armidale.nsw.gov.au			
<b>SUGGESTED IMPROVEMENT</b>			
Part	Clause	Page no.	Proposed Improvement and Justification