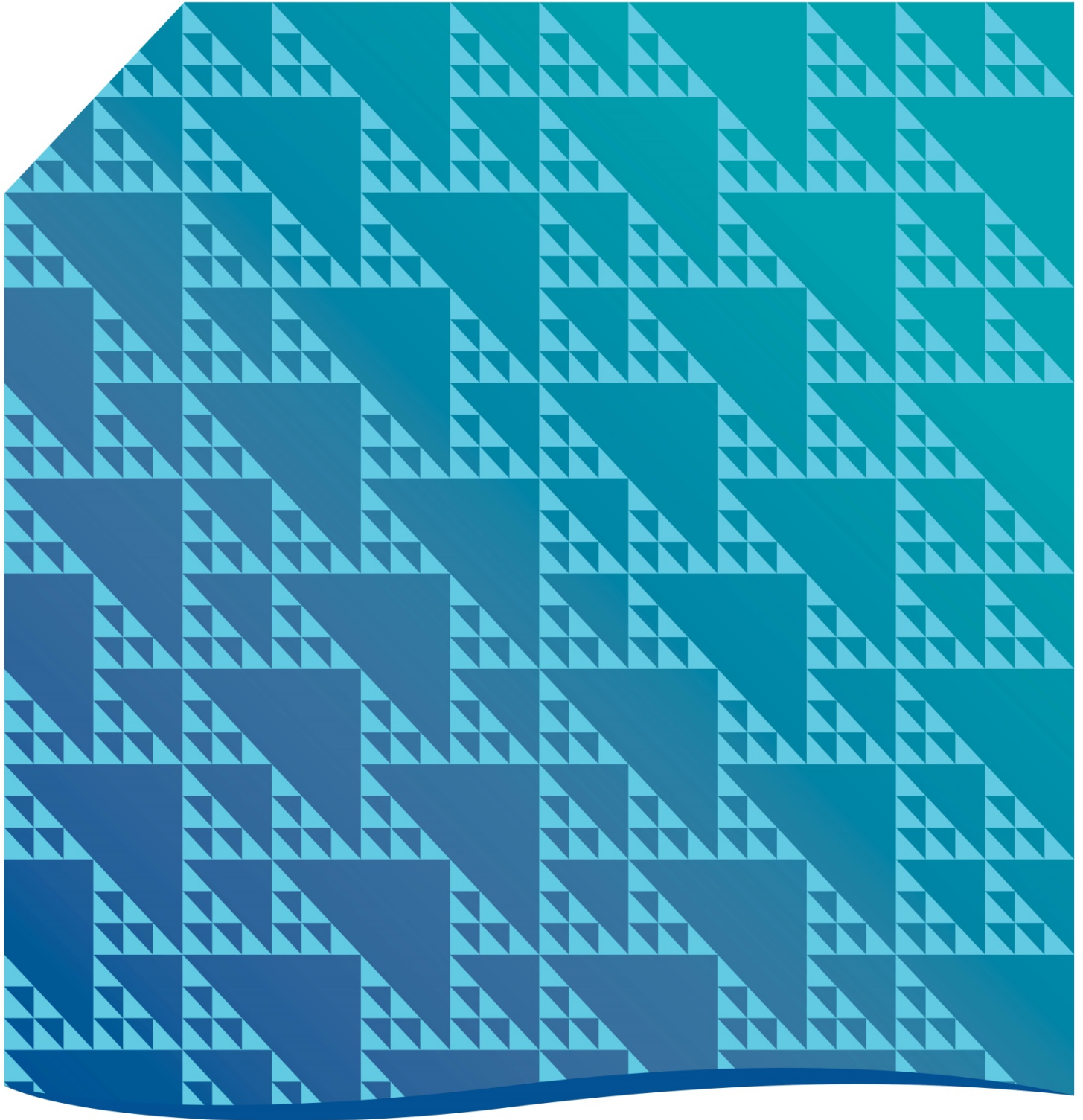


R32 Drainage: Culverts, Pipelines and Related Structures

Date: July 2014

Edition 1 / Revision 0

# Roadworks Specification



## REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1 / Rev 0	All	<i>'Department of State Growth'</i> replaces <i>'DIER'</i>	BW (MRA)	07.07.14
	R32.3	AS3972, AS1254 & AS5065 added, AS1260 removed		
	R32.6.1	Clause reworded		
	R32.6.1.1	New clause added		
	R32.6.1.2	New clause added		
	R32.6.2	AS reference changed		
	R32.6.3	New wording added, references updated		
	R32.6.4	New wording added		
	R32.6.6	Clause reworded		
	R32.6.7	Clause reworded		
	R32.7	New wording added		
	R32.8.1	Clause reworded, including wording from previous Clause R32.14.1		
	Table R32.1	Wording removed		
	R32.8.2	Wording removed		
	R32.14	Old 'Bedding' Clause removed, Replaces previous Clause R32.15		
	R32.15	Replaces previous Clause R32.16		
	R32.15.1	Includes wording from removed Clause R32.8.4		
	R32.15.2	Includes wording from removed Clause R32.8.5		
	R32.16	Replaces previous Clause R32.17		
	R32.17	Replaces previous Clause R32.18		
	R32.18	Replaces previous Clause R32.19		
	Table R32.5	New wording added and wording removed		

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**R32.1 SCOPE**

This specification sets out the requirements for the construction of drainage culverts, pipelines and related structures.

**R32.2 OBJECTIVES**

The objective of this specification is to ensure that road drainage infrastructure:

- is constructed to appropriate standards using acceptable materials
- continues to function as intended after construction is complete
- minimises and facilitates maintenance activities.

**R32.3 REFERENCES AND STANDARDS**

The construction of drainage culverts, pipelines and related structures shall be compatible with the provisions of all Department of State Growth Standard Specifications for Design, Construction and Maintenance, Austroads Guides and Test Methods and Australian Standards, in particular:

*Department of State Growth Standard Specifications*

- G1 – General Provisions
- G2 – Contract Management Plan
- G3 – Traffic Management
- G9 – Product Quality
- R22 – Earthworks
- R23 – Subgrade Zone
- R81 – Minor Concrete Structures.

*Austroads*

- AP-C87/10 Glossary of Austroads Terms.

*Austroads Guide to Road Design*

- Part 5 – Drainage.

*Australian Standards*

- AS 1254 PVC-U pipes and fittings for stormwater and surface water applications
- AS 1289 Methods of testing soils for engineering purposes
- AS 1597 Precast reinforced concrete box culverts
- AS 1646 Elastomeric seals for waterworks purposes
- AS 1683 Methods of test for elastomers
- AS 1830 Grey cast iron
- AS 2032 Installation of PVC pipe systems
- AS 2033 Installation of polyethylene pipe systems
- AS 2566 Buried flexible pipelines
- AS 3600 Concrete structures
- AS 3725 Design for installation of buried concrete pipes
- AS 3735 Concrete structures for retaining liquids
- AS 3972 General purpose and blended cements
- AS 3996 Access covers and grates
- AS 4058 Precast concrete pipes (pressure and non-pressure)
- AS 4130 Polyethylene (PE) pipes for pressure applications
- AS 4139 Fibre reinforced concrete pipes and fittings
- AS 5065 Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications.

*Other Standards and Test Methods*

- BS ISO 4660 Rubber, raw natural. Colour index test.

## R32.4 CONTRACT MANAGEMENT PLAN (CMP)

Further to *Standard Specifications G2 Contract Management Plan and G9 Product Quality* the Contractors CMP shall include:

- Details of the product including name, manufacturer, country of origin, supplier, test conditions and criteria
- Quality Management System of the Product Manufacturer and Product Supplier
- Cross references between site lot numbers and the unique product number.

## R32.5 PROPRIETARY PRODUCTS AND PROCESSES

For the purposes of this specification, all precast units, pit covers, PVC and polyethylene drainage pipes and fittings and other systems that are not covered by this specification are classed as Proprietary Products and/or Processes.

The Contractor shall provide evidence that all proprietary products used have demonstrated satisfactory field performance for a period of at least three (3) years.

Such evidence shall include full details of the products properties.

## R32.6 MATERIALS

### R32.6.1 Concrete Pipes and Fittings

All drainage culverts and pipelines under trafficable carriageways shall be rigid, reinforced concrete pipes.

Semi rigid and flexible pipes shall not be used under trafficable carriageways but may be used outside of the trafficable carriageways for longitudinal drains or other installations.

Class 2 pipes shall be used unless indicated otherwise in the Contract Documentation.

For Design and Construct contracts, pipes shall be designed by a qualified engineer to accommodate the loads required under the contract. Pipes which are or exceeding 1200mm in diameter shall be certified by an engineer who is a Chartered Professional Engineer (NPER), Member of Engineers Australia.

The design shall consider all durability aspects to ensure that the pipes are suitable for the environment and its design life.

#### R32.6.1.1 Precast Steel Reinforced Concrete Pipes

Precast steel reinforced concrete pipes and fittings shall be manufactured in accordance with *AS 4058* and shall have a design life of 100 years.

The design diameter as defined in *AS 4058* shall not be less than 95% of the nominal size shown on the drawings for all classes of pipes up to and including Class 4.

Joints for:

- Pipes less than DN650 shall normally be rubber ring spigot and socket joints
- Pipes greater than DN650 shall normally be flush joint pipes with external joint bands.

#### R32.6.1.2 Fibre Reinforced Concrete Pipes

Fibre reinforced concrete pipes and fittings shall be manufactured in accordance with *AS 4139* and shall have a design life of 100 years.

Fibre reinforced concrete rigid pipes may be supplied in diameter sizes up to and including 750mm.

Fibre reinforced concrete rigid pipes shall comply with the rigid pipe strength requirements of *AS 4139, Clause 11.1(a)*, with the load regression factor (R) determined in a manner consistent with the design life of 100 years.

The design diameter as defined in *AS 4139* shall not be less than 95% of the nominal size shown on the drawings for all classes of pipes up to and including Class 4.

Joints for fibre reinforced concrete pipes shall consist of a flexible elastomeric, double V-ring joint and an external collar in accordance with *AS 4139, Appendix M figure M1 (b)(i)*. Flush or butt joints shall only be used for the first pipe when extending existing pipes.

#### **R32.6.2 PVC Pipes and Fittings**

PVC pipes and fittings shall be in accordance with *AS 1254*.

Pipes DN150 or larger shall be rubber ring spigot and socket joints.

PVC pipes shall not be used under traffic carriageways but may be used outside of the traffic carriageways for longitudinal drains or other installations.

#### **R32.6.3 Polyethylene & Polypropylene Pipes and Fittings**

Polyethylene & Polypropylene pipes and fittings shall comply with *AS 5065*.

Polyethylene pipes and fittings shall also comply with *AS 4130 and AS 2566.1* where relevant to the application.

Mechanical, electrofusion or butt-welded joints installed in accordance with manufacturer's requirements may be used.

Pipe class shall be PN 6.3 PE 80.

Polyethylene and Polypropylene pipes shall not be used under trafficable carriageways but may be used outside of the trafficable carriageways for longitudinal drains or other installations.

#### **R32.6.4 Rubber Rings and External Rubber Bands**

Rubber rings shall be in accordance with *AS 1646*.

Flexible elastomeric, double V-rings used in fibre reinforced concrete pipe joints shall be in accordance with *AS 1646*.

External rubber bands for use with internal flush joint concrete pipes shall be manufactured from natural rubber of hardness 60 deg. IRHD in accordance with *BS ISO 4660, Grade 5*. They shall have a minimum tensile strength of 18 MPa and a minimum elongation of 400% at break as determined in accordance with *AS 1683, Method 11*.

The bands shall be 140 mm minimum width for pipe diameters up to 1,125 mm and 220 mm minimum width for larger diameter pipes. Band thickness shall not be less than 2 mm.

#### **R32.6.5 Access Chambers**

Pre-cast, reinforced concrete access chambers shall be constructed in accordance with *Standard Specification R81 Minor Concrete Structures*.

Access chambers, covers and surrounds shall be Grade N25 concrete complete with lifting lugs.

Covers for access chambers shall have 600mm minimum clear opening.

**R32.6.6 Pit covers**

Pit covers shall be manufactured in accordance with AS 3996.

Pit covers in trafficable areas shall be heavy-duty cast iron with precast concrete, to comply with AS 3996 Class D (Heavy Duty). Pit covers for non-trafficable areas shall be medium-duty cast iron covers, to comply with AS 3996 Class C (Medium Duty).

Cast iron covers and frames shall be of cast iron grade T200 in accordance with AS 1830. Cast iron covers shall be ribbed style concrete filled. The cover shall be fitted with keyholes complete with plastic protection plugs. Frame bolts shall be hot dipped galvanised.

Alternative pit covers manufactured from other materials are considered proprietary products and can be used with approval by the Superintendent, however provision of evidence of compliance with AS 3996 is required.

**R32.6.7 Precast Concrete Units**

Precast concrete units, including pits, endwalls and dissipators, shall be manufactured in accordance with AS 1597, AS 3600, AS 3735 or *Standard Specification R81 Minor Concrete Structures* as appropriate.

Precast units shall only be used for the following:

- Pits on pipes up to 450mm dia
- Winged headwalls on pipes up to 750mm dia
- Straight headwalls on pipes up to 450mm dia
- Driveable headwalls on all sizes
- Access chambers on all sizes (minimum 600mm dia).

All precast units shall be manufactured to meet the specific design requirements of each individual installation.

The cut-outs for entry/exit pipes shall not exceed the pipe diameter by more than 30mm. Once installed, the pipe-to-unit joint shall be grouted using flowable grout.

The bedding for pre-cast concrete units, shall be in accordance with this specification, except for pipes larger than 1200mm and precast culvert units where the founding material shall be in accordance with the requirements in the design drawings and approved by the Superintendent.

**R32.7 EVIDENCE OF COMPLIANCE**

The Contractor shall demonstrate compliance with all the requirements of this specification as a condition of payment. The methods by which the Contractor will monitor and demonstrate compliance shall be detailed in the Contract Management Plan (CMP).

The performance of the Contractor shall be measured according to the following criteria:

- The procedures detailed in the CMP, in particular the points listed in this specification
- Provision of all reports
- The effectiveness of the installation
- No damage to pipes, pits or other road infrastructure.

Where proprietary products have been approved, the evidence shall also show that the Contractor has been trained by the product supplier to install/use their proprietary products, particularly precast units.

For culverts and pipelines the invert levels and coordinates of the pipes at inlet, pits and outfall shall be recorded prior to payment and, when stability is questioned, also at Practical or Final Completion.



## R32.8 PIPE BEDDING AND SUPPORT MATERIALS

### R32.8.1 General

Bedding shall be provided for all pipelines laid below ground and for other structures as may be indicated on the Drawings.

The bedding system shall comprise:

- Pipe underlay, ie. the material on which the pipe is laid
- Pipe side support, ie. the material which supports the side of the pipe and includes the haunch zone (rigid pipes) and primary pipe zone (flexible pipes).

All bedding for underground pipelines shall be in accordance with the *Table R32.1 – Australian Standards*.

**Table R32.1 – Australian Standards**

Standard	Application	Pipe Classification
AS 3725	Concrete pipes	Rigid and semi-rigid
AS 2032	PVC pipes	Flexible
AS 2033	Polyethylene pipes	Flexible

However, it is to be noted that the use of a concrete bedding (AS 3725 bedding Type H3) or the laying of pipes directly on the excavated foundation (AS 3725 bedding Type U) is not permitted without the prior approval of the Superintendent. Other, un-listed flexible pipes shall be laid in accordance with AS/NZS 2566.2.

### R32.8.2 Pipe Support (Bedding)

Unless shown otherwise on the drawings, rigid pipes under the trafficked lanes shall be laid on AS 3725 bedding Type HS2 as minimum support. Rigid pipes laid outside of the trafficked lanes, or under accesses, or as median pipes, may be installed on AS 3725 bedding Type H1 as minimum support, or Type H2 or Type HS support, as conditions dictate.

The final selection of the type of support for these pipes shall be determined by the Contractor in accordance with *Table R32.2 – Pipe Bedding* and submitted to the Superintendent for approval, prior to installation.

**Table R32.2 – Pipe Bedding**

AS 3725 Bedding Configuration	Selection Criteria
Haunched Types H1 and H2	Where the trench or embankment materials have been determined as competent for providing sufficient lateral support to the haunched zones.
Haunched Types HS1, HS2 and HS3	Where the trench or embankment materials comprise soft clays, swelling soils or soils containing significant quantities of organic material and have been determined as having insufficient density and stiffness to provide good lateral support to the haunch zones OR in instances where semi-rigid pipes are to be laid.

Semi-rigid pipes shall not be laid under the trafficked lanes and may only be installed on AS 3725 Type HS2 as minimum support.

### R32.8.3 Bedding Materials

The bedding and support materials to be used shall conform to the *Table R32.3 – Bedding Material* (consolidated from AS 3725).

**Table R32.3 – Bedding Material**

Bedding Type	H1 and H2	Grading Limits for Select Fill for Bed and Haunch Zones	
		Sieve size (mm)	Weight passing (%)
		19.0	100
		2.36	100 to 50
		0.60	90 to 20
		0.30	60 to 10
		0.15	25 to 0
		0.075	10 to 0
Bedding Type	HS	Grading Limits for Select Fill for Side Zones	
		Sieve size (mm)	Weight passing (%)
		75.0	100
		9.50	100 to 50
		2.36	100 to 30
		0.60	50 to 15
		0.075	25 to 0

Single sized aggregates may also be used for pipe bedding and support material:

- 7mm aggregate for pipes up to 450mm dia
- 10mm aggregate for pipes greater than 450mm dia.

Where single sized aggregates are used for pipe bedding, if required, measures must be adopted to prevent water from entering the bedding at the high point and to ensure drainage from the bedding at the low point. Drainage requirements for the pipe bedding will be at the discretion of the Superintendent.

Bedding and haunch material shall be placed and compacted in layers no greater than 150 mm compacted thickness. The initial bedding layer shall be placed and compacted to true line and level and provided with carefully-located recesses to accommodate joint sockets, all prior to laying the pipes. Haunching and backfilling to then proceed to completion.

Compaction of the bedding and haunch materials shall be in accordance with *AS 3725, Part 8* which refers cohesive and cohesionless soils (materials) compacted to *AS 1289*, summarised in the *Table R32.4 – Bedding Compaction*.

**Table R32.4 – Bedding Compaction**

Zone	Minimum Relative Compaction for Bedding Type (as determined by AS 1289.5.4.1)				
	H1	H2	HS1	HS2	HS3
Bedding and Haunch	50%	60%	50%	60%	70%
Side (cohesive soils)	-	-	85%	90%	95%
Side (cohesionless soils)	-	-	50%	60%	70%

Care shall be taken to ensure that haunch material is compacted as specified to support the pipe. Testing of cohesionless material layers will be at the discretion of the Superintendent. Flooded sand bedding will only be accepted if it is compacted with immersion vibrators.

### R32.9 SETTING OUT

The Drawings indicate nominal lengths and locations of pipes. The Contractor shall adjust the actual lengths and locations of the pipes on site to suit the surrounding terrain and existing drainage systems, while maintaining specified grades and flow capacity. The Contractor shall carry out all necessary survey work for this purpose.

## R32.10 EXCAVATION

### R32.10.1 Construction of Embankment before Pipe Installation

Where pipes are to be installed through embankments, the embankments shall be first constructed and compacted to a height of not less than 300 mm above the crown of the pipe for a distance of not less than five (5) times the diameter of the pipe on either side, according to the requirements of *Standard Specification R22 Earthworks*.

A trench shall then be excavated through the embankment and the pipe laid as specified in the following clauses.

### R32.10.2 Excavation of Trenches

#### R32.10.2.1 General

Excavation for installation of pipes shall include all excavation necessary to prepare the foundation and to provide the specified depth of bedding.

The width of the trench shall be the minimum to allow for proper jointing of the pipe sections and thorough compaction of the bedding and select backfill material under and around the pipe. Where practicable, trench walls shall be vertical. If the trench depth exceeds 1.5m shoring shall be used in accordance with the relevant Statutory requirements. If trenches are wider than shown on the design then the Contractor shall confirm that the pipe class is adequate for the constructed conditions and the proposed compaction methods.

#### R32.10.2.2 Excavation of Rock

Where the material to be excavated comprises hard, solid beds or masses that cannot be removed without blasting or use of pneumatic or hydraulic picks, hammers or wedges, then this material shall be classified as rock for the purposes of payment subject to the Superintendent's approval.

## R32.11 TRENCH BASE

### R32.11.1 Compaction

The trench base shall be compacted to a characteristic dry density ratio of 95% of Standard Compaction before placing bedding. The base of the excavated trench shall be trimmed neat and uniform for its full length with a CBR of at least 8.

### R32.11.2 Unsuitable Trench Base

Soft, wet or unsuitable areas at depths less than 150 mm below the level of the minimum required thickness of pipe bedding, and all soft, wet or unsuitable areas of any depths which have been caused by the Contractor's negligence or improper methods, shall be excavated and replaced with material complying with *Standard Specification R23 Subgrade Zone*, spread and compacted as below, at the Contractor's expense.

Where approved in writing by the Superintendent, soft wet or unsuitable areas, at depths exceeding 150 mm below the level of the minimum required thickness of pipe bedding, shall be excavated and backfilled with material complying with *Standard Specification R23 Subgrade Zone*, spread and compacted as below.

The new material shall be spread in layers not exceeding 200 mm thickness and compacted to a characteristic dry density ratio of 95% of Standard Compaction.

## R32.12 INTERSECTING SERVICES

The following minimum clearance shall be provided between new drainage works and existing services.

- For conduits DN525 and greater 300 mm
- For other conduits 150 mm.

**R32.13 REMOVAL OF EXISTING PIPEWORK AND STRUCTURES**

The Contractor shall remove, from under the new pavement and new embankments, all pipes, endwalls and pits that are abandoned, and all endwalls on pipes to be extended, unless otherwise noted on the Drawings.

Where shown on the Drawings, the Contractor shall remove abandoned pipes, endwalls and pits from areas outside the new works.

Where abandoned pipes, endwalls and pits are within areas to be excavated, they shall be considered part of the excavation, and included in the cost of excavation.

**R32.14 PIPE LAYING AND JOINTING*****R32.14.1 Laying of Pipes***

Laying pipes shall commence at the downstream end and proceed upstream. Pipes shall be laid with the socket end placed upstream. Pipes shall bear evenly on compacted bedding.

Pipes shall not deviate from the required line by more than 10 mm in the vertical or horizontal alignment.

Pipes with damaged ends or barrels, such that performance or durability may be affected, shall not be used.

***R32.14.2 Jointing Pipe***

Rings or external bands shall be fitted in the manner described by the pipe Manufacturer before backfilling is commenced. Pipes shall be restrained from movement during backfilling to prevent possible joint leakage.

External bands shall be tightly fitted and centrally placed over the joint for its full circumference so as to provide a positive seal against water leakage. The interior of the joint shall be left unmortared.

Pipe anchors shall be constructed as shown on the Drawings.

**R32.15 TRENCH BACKFILLING*****R32.15.1 Select Backfill***

Select backfill shall be in accordance with side zone select fill as specified in AS 3725.

Select backfill material for the side zone and cover shall be placed and compacted around and to a minimum thickness of 300 mm over the pipe or as shown on the Drawings.

The select backfill shall be placed and compacted in layers no greater than 200mm compacted thickness. Compaction as measured under AS 3725 shall be 95% RD minimum for cohesive materials, and 70% ID minimum for cohesionless materials.

Backfilling shall be placed and compacted on both sides of the pipe with minimal height differential to avoid displacement of the pipe. Testing of cohesionless material layers will be at the discretion of the Superintendent.

The Contractor shall ensure that his compaction equipment is managed so that the pipe is not damaged.

***R32.15.2 Ordinary Backfill***

Ordinary backfill shall consist of materials satisfying the requirements of *Standard Specification R23 Subgrade Zone*.

Ordinary backfill shall be built up to the lip of the trench, or the bottom of the sub-grade zone, whichever is the lower, in layers not exceeding 200mm thickness, and compacted to a characteristic dry density ratio of at least 95% of Standard Compaction.

### ***R32.15.3 Trenches Through Existing Pavements***

Where trenches are cut through existing pavements, the sub-grade zone and pavement layers shall be reinstated according to the requirements for Sub-grade Zone, Sub-base and Base.

## **R32.16 DRAINAGE STRUCTURES**

### ***R32.16.1 General***

Unless shown otherwise on the Drawings, endwalls and pits shall be constructed parallel to the edge of the road. The footings of the endwalls, pits, access chambers, dissipators and miscellaneous stream-control structures shall extend to the depths indicated on the Drawings.

Where approved in writing by the Superintendent, soft, wet or unstable areas, below the level of the footing, shall be excavated and backfilled with material complying with *Standard Specification R23 Subgrade Zone*. The material shall be spread in layers not exceeding 200mm thickness and compacted to a minimum characteristic dry density ratio of 95% of Standard Compaction.

### ***R32.16.2 Concreting***

All concrete work shall be carried out in accordance with *Standard Specification R81 Minor Concrete Structures*.

### ***R32.16.3 Access Chambers***

Tops of access chambers shall be finished flush with the surrounding finished surface or as shown on the Drawings.

### ***R32.16.4 Existing Pits***

Where shown on the Drawings, the Contractor shall provide all materials to adjust the level and complete the grate or cover and surrounds of existing pits. The adjustment shall be such as to suit finished surface levels.

### ***R32.16.5 Culvert Outlet Protection Works***

Culvert outlet protection works, including aprons, dissipators and drops, etc. shall be provided as shown on the Drawings.

### ***R32.16.6 Precast Endwalls***

Precast endwalls shall be bedded on a prepared base of cohesionless material. Units shall be vibrated then be worked into final line and level to ensure proper bedding and geometric continuity. The bedding shall then be pressure grouted to eliminate any voids. For culverts serving access crossings, the top of the endwall shall not be more than 50 mm above the adjacent access surface level.

## **R32.17 PAYMENT**

### ***R32.17.1 Pipes***

The unit of measurement shall be linear metres.

Payment for the installation of pipes shall be based on the rate for the class and size of pipe quoted in the Schedule of Rates.

Where multi-barrel installations are required, payment shall be made on the length between the outside of each endwall and not on the total length of pipe in each structure.

The rate of installation of pipes shall include the cost of preparatory work, excavation, supply of materials, fencing of excavation, bedding, laying and jointing of pipes, supply, placing and compaction of haunching, select and ordinary backfill, subgrade zone and pavement materials where required, disposal of surplus excavated material, and inspection and testing. Where anchors are required, the rate for installation of the pipes shall include their cost.

Where culverts are placed in existing pavements where an overlay is required, the rate of installation shall include the cost of subgrade zone and pavement materials up to the existing surface level only. The rate shall not include the cost of sealing.

Where culverts are to be extended the rate shall include the cost of all works required except the removal of the endwall.

### ***R32.17.2 Material Below Bedding and Footings***

The unit of measurement shall be cubic metres.

Payment for authorised excavation of unsuitable material at depths exceeding 150mm below the level of the minimum required thickness of pipe bedding, and below the footings of endwalls, pits, access chambers and dissipators, and the supply, placing and compaction of replacement material, shall be made for the quantity measured in place at the tendered rate quoted in the Schedule of Rates.

### ***R32.17.3 Removal of Existing Pipework and Structures***

The unit of measurement shall be:

- Pipework – linear metres
- Structures – number per type.

Payment for removal of existing pipes, endwalls and pits shall be based on the rate quoted in the Schedule of Rates.

Where multi-barrel installations are removed, payment shall be made on the length between the outside of each endwall and not on the total length of pipe in each structure.

The rate for removal of existing pipes, endwalls, access chambers and pits shall include the cost of excavation and disposal of all materials and the supply, placing and compaction of backfill, including subgrade zone and pavement materials. It shall not include the cost of sealing. The rate of removal of endwalls from pipes to be extended shall also include the cost of any remedial work necessary to allow for the extension of the pipe.

Where existing pipes, endwalls and pits are removed and replaced with new pipes, endwalls and pits at the same location, the rate for removal shall include only the cost of disposal of all materials.

The rate for removal of existing pipes shall also include the cost of sealing off removed pipes at existing pits which are to remain in service.

### ***R32.17.4 Drainage Structures***

The unit of measurement shall be the number per type.

Payment for endwalls, pits, access chambers, dissipators, outlet protection works, kerb scuppers and miscellaneous drainage structures shall be based on the rate per unit quoted in the Schedule of Rates. The rate shall include the cost of excavation, supply and installation of all materials and fittings, supply, placement and compaction of backfill and disposal of surplus excavated material.

The rate for construction of endwalls, dissipators and outlet protection works shall also include the cost of the supply and placing of geotextile and rock protection associated with these structures.

The rate for construction of separate structures shall include the complete structure comprising headwall, wingwall, cut-off wall, geotextile, rock protection and apron as appropriate.

The rate for construction side entry pits, kerb-side grated pits and kerb scuppers shall include the cost of construction of 1.5 metres of kerb and channel each side of the centreline of the pit or kerb scupper.

The rate for construction of pits shall include the cost of connecting new and existing pipes and sub-soil drains into pits.

#### ***R32.17.5 Excavation of Rock***

The unit of measurement shall be cubic metres of solid volume.

Payment for the excavation of rock from trenches, endwalls and pit surrounds shall be based on the rate quoted in the Schedule of Rates.

Payment for rock shall be made only for the volume excavated from the minimum trench width as defined in *Clause R32.10.2*. For endwalls and pits, payment for rock shall be made only for the volume excavated to 300 mm beyond the outside dimensions of the structure.

The rate for excavation of rock shall include the cost of disposal of surplus excavated material.

#### ***R32.17.6 Adjustment to Surrounds of Existing Pits and Access Chamber Covers***

The unit of measurement shall be the number per type.

Payment for adjustment to surrounds of existing pits and access chamber covers shall be based on the rate per unit quoted in the Schedule of Rates.

The rate for adjustment to surrounds of existing pits and access chamber shall include the cost of removal of existing tops, removal of affected adjacent areas such as kerb and channel, reinstatement of those areas and disposal of surplus materials. The cost of reinstatement of kerb and channel, 1.5 metres each side of the centreline of side entry pits and kerb-side grated pits, shall be included in the rate for adjustment. Payment for all other reinstated kerb and channel shall be based on the rate for construction of kerb and channel.

#### ***R32.17.7 Connection of Pipes to Existing Pits and to Other Pipes***

The unit of measurement shall be the number per type.

Payment for connection of pipes into existing pits and for lateral connections of smaller diameter pipes into larger diameter pipes shall be based on the rate per unit quoted in the Schedule of Rates.

The rate for connection of pipes into existing pits and for lateral connections of smaller diameter pipes into larger diameter pipes shall include the cost of breaking into the larger pipes or existing pits, jointing and disposal of waste material.

### **R32.18 HOLD POINTS**

The following hold points have been identified in this Specification:

Hold Points identified in this Specification are listed in *Table R32.5 – Hold Points*.

*Table R32.5 – Hold Points*

<b>Reference</b>	<b>Holdpoint</b>	<b>Nominated Work not to proceed</b>	<b>Evidence of Compliance</b>
R32.5	Supply of Proprietary Products and/or Processes	Placement of product	Certificate of Compliance from the Product Manufacturer and Product Supplier including Specific tests results for the product and nomination of where each product will be used to the satisfaction of the Superintendent
R32.10.2	Prior to rock excavation	Excavation of rock	Evidence that is satisfactory to the Superintendent
R32.6.7	Upon completion of trench excavation for pipe exceeding 1200mm	Placement of bedding	Evidence that the founding material and the trench is suitable and acceptable to the Superintendent
R32.11.2	Prior to removal of soft, wet or unsuitable material	Removal of material	Evidence that is satisfactory to the Superintendent





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