ROADS AND MARITIME SERVICES (RMS)

QA SPECIFICATION R23

PLASTIC FLEXIBLE PIPES

REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed1/Rev2	4	Figures referred have now been included within Part R9.	GM, CMS	18.09.91
Ed2/Rev0		Clause numbers and lists restructured to suit new format.	GM, CEC per JW (MCQS)	27.03.95
	3	Hold point has been rewritten.		
	5	Measurement and Payment clause has been reorganised.		
Ed2/Rev1		Specification Number changed from R9 to R23. Converted to MS Word 6.0c. References to RTA Specifications changed.	GM, RNIC; (J Woodward)	07.01.97
	1.2	RTA R1 added to references.		
Ed 3/Rev 0		General Revision	GM, RNIC	24.05.00
Ed 3/Rev 1	1.1	Restrictions under pavements	GM, RNIC	06.03.01
Ed 4/Rev 0		Reformatted with new annexure Numbers.	GM, RNIC	27.02.04
	Various	”Contractor” replaced by “you” ”RTA’s Representative” replaced by “Principal” Cross references changed		
	2.2, 2.3.2, 3, 4.1, 4.4 - 4.6	Minor editorial changes		
	1.1	Restrictions under pavements revised		
	1.2	Transferred to Annexure G22/M		
	1.2	New subclause		
	1.3	Transferred to Annexure G22/D		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 0 (cont'd)	1.4	Transferred to Annexure G22/L		
	4.3.1	Ensure trench location is correct		
	4.4	Jointing requirements		
	5	Check after construction loadings		
	Annx R23/M	Reference – AS/NZS 2566.2 added		
Ed 4/Rev 1	Various	Text revised to direct imperative style Minor editorial changes	GM, RNIC	05.10.05
	Foreword	New clause after the Table of Contents		
	C1	Last paragraph rephrased.		
Ed 4/Rev 2	"Notice"	RTA PO Box and Fax numbers updated	GM, IC	12.05.09
	Foreword	Copyright clause added		
	Global	"shall" replaced by "must"		
	1.2	Sub-clauses 1.2.1 to 1.2.5 renumbered		
	1.2.5	Definition of "you" and "your" added		
Ed 4/Rev 3	1.1	Polypropylene added to list of materials covered	GM, IC M Andrew	16.10.09
	Annexure R23/M	References updated: AS 4130 replaced by AS/NZS 5065		

GUIDE NOTES

(Not Part of Contract Document)

TECHNICAL REFERENCE NOTES

AS 2566 - 1982, Plastic pipeline design, has been superseded by AS/NZS 2566, Buried flexible pipes; Part 1: Structural design 1998 and Part 2: Installation 2002.

The 1982 version of the Standard related basically to UPVC pipes, whereas the revised version is applicable to buried flexible pipes manufactured from homogeneous or composite materials; of plain or structured wall construction; and plastic (UPVC, OPVC ABS, GRP, PE) or metallic (Aluminium, Steel, Ductile iron) materials of manufacture. It should be noted, however, that a number of separate Standards specify requirements related to buried corrugated metal pipes.

This expanded application of the Standard provides Designers with the opportunity of incorporating pipelines of the foregoing types of construction into stormwater drainage works, in lieu of rigid pipes, e.g. fibre-reinforced and steel-reinforced concrete.

Also, provided suitable data can be obtained, the Standard can be applied to pipelines manufactured from materials similar to those specifically indicated above, but which are not covered in detail by the Standard. This permits the Standards application to manufacturer specific products such as Hobas, Black Brute, Rib Lock 2000, etc.

Designers are referred to Part 1 of the Standard, and the supplementary Commentary, in regard to structural design requirements associated with buried flexible pipes. Reference should also be made to DIR 91/21 - Evaluation of Alternative Products for Stormwater Drainage.

The format of RMS R23 conforms to that of the current revision of RMS R11. It covers the pipe supply and construction only. RMS R11 is specifically referenced for material requirements, construction details and tolerances and payment for other drainage structures of concrete construction and common pipe construction details.

The application of this revision to RMS R23 is constrained to plastic pipes. Smooth bore metallic pipes are not covered. Corrugated metal pipes are covered by RMS R22.

Explanation of specific changes not related to the reformatting to suit RMS R11:

Clause 1.1 Scope

The minimum cover requirement over a flexible pipe is related to the criteria used in pavement overlay design whereby an approximate 6 percent reduction in deflection is adopted for each 25 mm of granular overlay thickness where no other major improvements are made.

For example, for a moderately trafficked road (5×10^6 ESAs design) the characteristic design deflection (average deflection + 1.3 x standard deviation) at the surface under a Benkelman Beam is 0.93 mm.

The lateral support of the pipe and the cover need to be adequate to avoid increases in deflection at the surface.

Use of flexible pipe, without stabilised backfill in the Embedment Zone and other substantial improvement, is to be restricted to unbound granular pavements.

Clause 2.4.1 Embedment Zone/Material

The revised Standard requires that all materials in the Embedment Zone surrounding the installed pipe are of the same characteristics and are compacted equally. There is no differentiation in the revised Standard between bed/haunch/side/overlay fill materials. The Embedment Zone is the combination of the bed, haunch support, side support and overlay zones. The Standard permits the use of a variety of Embedment Materials. The RMS R11 Type BH (bed/haunch) select fill material has been specified as it is compatible with the requirements of the revised Standard and its use will minimise the variety of fill materials required on site. The RMS R11 Type SO (side/overlay) select fill is not compatible with the Standard as the specified upper particle size is significantly greater than that permitted.

Clause 3 Transport, handling and storage

This Clause has been added to cover requirements specific to flexible pipes. In particular, many types of plastic pipes are subject to UV damage and heat distortion. The Clause is a modified extract from AS/NZS 2566.2.

Clause 4.3.1 Excavation - General

Paragraph 3 of this Clause requires a moduli of the native soil material within the zone of influence for side support of the pipe to be specified. In the absence of geotechnical information the designer has to assume a value of this moduli at the specified relative compaction. Native soil material within the zone of influence will have to be replaced if the actual moduli of the material is less than the specified value. If, however, this moduli is known to the designer from available geotechnical information or because of the installation condition then this paragraph is redundant.

Clause 4.4 Installation

This Clause has been revised to take account of the expanded scope of the application of the Specification and compatibility with similar Specifications in the area of pipelaying requirements. Specific reference is made to handling, cover and temperature requirements which are modified extracts from AS/NZS 2566.2

Clause 6 Commissioning

This Clause has been added to cover requirements specific to flexible pipes. In particular, plastic pipes can be damaged by contaminants introduced during transport, storage and construction. The Clause is a modified extract from AS/NZS 2566.2.

Transport Roads & Maritime Services

NSW GOVERNMENT

QA SPECIFICATION R23

PLASTIC FLEXIBLE PIPES

IC-QA-R23

VERSION FOR:
DATE:

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CLAUSE PAGE

FOREWORD

RMS COPYRIGHT AND USE OF THIS DOCUMENT

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REVISIONS TO PREVIOUS VERSION

This document has been revised from RMS Specification R23 Edition 4 Revision 2.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:

(a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.

(b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

RMS QA SPECIFICATION R23

PLASTIC FLEXIBLE PIPES

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the construction of buried plastic flexible pipes for stormwater drainage or as part of a stormwater drainage system. It applies specifically to plain or structured wall plastic pipes and fittings manufactured from the following materials:

(a) unplasticized polyvinyl chloride (UPVC);

(b) oriented polyvinyl chloride (OPVC);

(c) acrylonitrile butadiene styrene (ABS);

(d) glass filament reinforced plastics (GRP);

(e) polyethylene (PE); and

(f) polypropylene (PP).

It also applies to pipes and fittings manufactured from other homogeneous and composite plastic materials, where shown on the Drawings, or where proposed by you, and approved by the Principal, for incorporation into the Works.

This Specification must be applied in conjunction with RMS R11 which specifies material requirements, construction details, tolerances and measurement and payment for other drainage structure components of concrete construction and common pipe construction details.

Plastic flexible pipes may be used directly under road pavement structure:

(a) where:

  (i) the pavement is an unbound granular pavement with thin bituminous surfacing not more than 50 mm thickness;

  (ii) a minimum 750 mm of cover or 1.5 times the pipe diameter, whichever is greater is provided over the pipe to the road surface at any point under the road pavement and shoulders; and

  (iii) the pipe is a single pipe installation unless backfill in the Embedment Zone is stabilised with a minimum 4% cementitious binder and pipes are separated by a minimum two and one half pipe diameters;

  or

(b) when approved by the Principal.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Measurement and Payment

The method of measurement and payment must comply with Annexure R23/B.

1.2.2 Schedules of HOLD POINTS and Identified Records

Annexure R23/C lists the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to RMS Q for the definitions of **HOLD POINT** and **WITNESS POINT**.

The records listed in Annexure R23/C are **Identified Records** for the purposes of RMS Q Annexure Q/E.

1.2.3 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure R23/D and must be implemented.

If the Contract does not require the Contractor to implement a PROJECT QUALITY PLAN, the documents listed in Annexure R23/D must be submitted to the Principal for consideration at least 5 working days prior to work commencing and must be implemented.

In all cases where RMS R23 refers to manufacturers' recommendations, these must be included in the PROJECT QUALITY PLAN.

1.2.4 Sampling and Testing

Sampling and testing of materials, components and compaction must comply with Annexure R23/L and RMS Q.

1.2.5 Referenced Documents

Unless otherwise specified or is specifically supplied by the Principal, the applicable issue of a reference document is the issue current at the date one week before the closing date for tenders or, where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1254). For convenience, the full titles are given in Annexure R23/M.

1.3 DEFINITIONS

The terms "you" and "your" mean "the Contractor" and "the Contractor's" respectively.

The following interpretations apply to terms used in this Specification:

(a) **Embedment Material**: Material with specific grading and plasticity properties to facilitate achievement of a specified compaction, placed around flexible plastic pipes in the Embedment Zone.

(b) **Embedment Zone**: A geometric area defined by AS/NZS 2566.1 around plastic flexible pipes, comprising the bedding, side support and overlay zones, containing compacted Embedment Material.

(c) **Backfill**: Fill material (trench or embankment) placed over the Embedment Zone for the purpose of refilling a trench or creating part of an embankment.

(d) **Selected Material**: Material defined in RMS R44 with superior properties to facilitate the achievement of a specified compaction used in the Selected Material Zone.

(e) **Selected Material Zone**: The top layer of earthworks immediately below a pavement as defined in RMS R44.

2 MATERIALS

2.1 PLASTIC FLEXIBLE PIPES AND FITTINGS

The manufacturer must implement and maintain a Quality Management System in accordance with ISO 9001 as a means of ensuring that the plastic flexible pipes and fittings conform to the requirements of the Specification.

Plastic flexible pipes and fittings must be manufactured in accordance with the relevant Australian Standard listed in Annexure R23/M. Where no applicable Australian Standard exists for a particular material, then the pipes and fittings must be manufactured in accordance with:

(a) the relevant Overseas or International Standard specified or shown on the Drawings, or approved by the Principal; or

(b) the manufacturer's specification of the material specified or shown on the Drawings, or approved by the Principal.

100mm diameter uPVC pipes shall be Class SN6, solid walled, solvent welded. uPVC pipes larger than 100mm diameter shall be Class SN8.

2.2 CERTIFICATE OF COMPLIANCE

Prior to incorporating into the Works plastic flexible pipes and fittings, provide the Principal with a signed Certificate, verifying that the materials and components comply with the requirements of this Specification.

The Certificate described above must identify the item and the inspection and test records that verify conformity. The inspection and test records must be available for inspection as part of the Quality Records.

HOLD POINT

Process Held:	Incorporation into the Works of plastic flexible pipes and fittings.
Submission Details:	Certificate of Compliance, at least seven (7) days prior to incorporation in the Works.
Release of Hold Point:	The Principal may audit the Quality records prior to authorising the release of the Hold Point.

2.3 EMBEDMENT AND BACKFILL MATERIALS

2.3.1 Embedment Material

Material for pipe embedment must consist of Type BH select fill. Type BH select fill must have:

(a) a particle size distribution, determined by RMS T201, within the limits as set out in Table C2 of AS/NZS 2566.1 (equal to Table 3 of AS 3725); and

(b) a Plasticity Index, determined by RMS T109, of not more than 6.

2.3.2 Backfill

Backfill and Selected Material in the Selected Material Zone must comply with the material requirements of Specification RMS R44.

3 TRANSPORT, HANDLING AND STORAGE

Support all plastic flexible pipes during transportation in a manner recommended by the manufacturer. Prevent chaffing and shock damage during transit by methods such as covering or wrapping with suitable material the supports, restraints and packing bearing on pipe and fitting surfaces. Chains must not come into direct contact with pipes and fittings.

During unloading, handling and installation, protect the pipes and fittings to prevent damage such as impact scoring or crushing from ropes and slings.

On delivery, inspect the pipes and fittings internally and externally to ensure that no damage has occurred to the jointing surfaces or wall structure that would effect their performance. Subject any pipe or fitting that has been damaged to the requirements for nonconforming product specified in RMS Q. When repairs are proposed, submit a Nonconformity Report for the Principal's acceptance and which states all repairs must be carried in accordance with the manufacturer's recommendations.

The method of storage and the maximum outdoor storage periods must be in accordance with the manufacturer's recommendations. Where necessary, shield pipes and fittings from sunlight to avoid UV damage and heat distortion.

4 CONSTRUCTION

4.1 GENERAL

Construction of plastic flexible pipes includes:

(a) excavation for pipes, including, the installation and removal of trench support systems and the preparation of foundations;

(b) supply, laying and jointing of pipes;

(c) provision of anchor blocks;

(d) supply, placing and compacting Embedment Material and Backfill and

(e) supply and placing subsurface pipes and filter fabric at pits, headwalls and wingwalls.

4.2 SETTING OUT

Set out the plastic flexible pipes and, where appropriate, other drainage structures as shown on the Drawings in sufficient detail to identify the locations specified in, and to comply with, the requirements of the relevant clause of Specification RMS R11.

4.3 EXCAVATION FOR PLASTIC FLEXIBLE PIPES

4.3.1 General

The completion of the required preliminary erosion and sedimentation control measures must precede the commencement of excavations for plastic flexible pipes.

The width of trench excavations for plastic flexible pipes must be as shown on the Drawings, or where no dimension is shown, in accordance with minimum dimensions specified in AS/NZS 2566.1.

The modulus of the soil material within the zone of influence for side support of the pipe, as defined in AS/NZS 2566.1, must not be less than the figure specified or shown on the Drawings, for a value of relative compaction of 95%, when tested in accordance with the requirements of Clause 4.5.

WITNESS POINT

Process:	Excavation for plastic flexible pipes.
Submission Details:	Notify Principal, not less than 24 hours and not more than five (5) clear working days prior to the intended time of completing the excavation, that the excavation, including preparation of sides of trenches, will be completed.

Ensure the excavation is completed so that when the pipe/s is placed centrally in the trench, the Embedment Zone and pipe location will comply with Clauses 4 and 5.

4.3.2 Unsuitable Material

Comply with the requirements of the relevant Clause of RMS R11 regarding the notification of the presence, removal, disposal and replacement of unsuitable material. Compact the replacement material to the requirements of Clause 4.5.

4.3.3 Surplus Excavated Material

Comply with the requirements of the relevant Clause of RMS R11 regarding the use or disposal of surplus excavated material. No additional payment will be made for this work.

4.4 INSTALLATION OF PLASTIC FLEXIBLE PIPES AND FITTINGS

Unless otherwise specified, commence laying pipes at the outlet end and proceed upstream.

Remove all foreign matter from inside and outside of pipes before laying.

Install to the dimensions shown on the Drawings, or where no dimensions are shown, with the embedment geometry specified in AS/NZS 2566.1.

Handle the pipes and fittings during installation in accordance with Clause 3.

Install pipes in either the trench or the embankment condition as shown on the Drawings.

Where **Embankment Installation** condition is specified, prior to commencing placing bedding and laying pipes, place and compact embankment fill to the height of the top of the side support zone above the foundation and for a minimum lateral distance from the centreline of the pipe of 2.5 times the largest external diameter of the pipe. Provide an alternate waterway area unless otherwise approved by the Principal.

Where **Trench Installation** condition is specified for pipes in an embankment, complete the embankment to the top of the Embedment Zone prior to the commencement of excavation.

Lay pipes with socket connections with the sockets upstream.

Lay pipes to provide cover over the pipe not less than the minimum as shown on the Drawings, or, where no such cover dimension is shown, to comply with the minimum requirements for the appropriate location specified in AS/NZS 2566.1.

Trim the trench foundation to achieve the specified pipe grade. Fill any over-excavation with Embedment Material and compact it to the same relative compaction as that specified for the Embedment Material.

The pipe must be centred in the trench. Where two or more pipes are laid side by side, the clear distance between each pipe must be not less than that shown on the Drawings, or where no distance is shown, to comply with the requirements of AS/NZS 2566.1.

Jointing must be in accordance with the manufacturer's instructions and must comply with the relevant Standard, or specification, in accordance with Clause 2.1.

Deflections of rubber ring joints on uPVC pipes are not permitted. Curvature is to be obtained by bending the pipe whilst maintaining the position of the joint in the trench.

Use spigot and socket type joints with a rubber ring, unless approved otherwise by the Principal (flush or butt joints must only be used for the first pipe when extending existing pipes). Connections to precast headwalls and pits must be snug fitting and butt jointing of deformed pipes is not permitted. Connect pipes without local buckling.

Where a pipe has rigid joints and the absolute difference between the air temperature and the ground temperature at the time of installation exceeds 5^{o}C, the pipe must not be restrained or backfilled, until its temperature reaches the approximate ground temperature.

Install anchor blocks in accordance with the Drawings. Place in-situ concrete directly against all faces of the keys in the sides and base of the trench.

4.5 COMPACTION OF FOUNDATIONS, EMBEDMENT, REPLACEMENT AND BACKFILL MATERIAL

Sampling for compaction must comply with RMS Q Annexure Q/L.

Except where specified otherwise or unless directed otherwise by the Principal, compact all foundations, Embedment Material, replacement material and Backfill in layers not exceeding 150 mm compacted thickness.

Compact foundations, Embedment Material, replacement material and Backfill so that the minimum characteristic value of relative compaction, when tested in accordance with the Sampling and Testing Clause of RMS Specification for EARTHWORKS and RMS Q Annexure Q/L, is as follows:

(a) Selected Material within the Selected Material Zone: 100%

(b) Foundations to a depth of 150 mm below the bottom the Embedment Zone, Embedment Material, material replacing unsuitable material and Backfill: 95%

RMS Test Method T173 may be used to determine the field (in situ) density provided the testing is carried out in accordance with the Sampling and Testing Clause of RMS Specification for EARTHWORKS and you demonstrate that such testing produces equivalent results **for each trench** to those obtained using Test Method RMS T119.

4.6 CONSTRUCTION TRAFFIC

Where you propose to move heavy construction plant and vehicles over pipes before the minimum cover requirements for the passage of such traffic have been achieved, then implement design and provide protective measures for each crossing proposed and approved in accordance with RMS G2 and comply with the requirements of the relevant Clause of RMS R11.

5 CONSTRUCTION TOLERANCES

Construct the plastic flexible pipes so that the water flows through them without unintended ponding, and within the maximum construction tolerances in Table R23.1.

Table R23.1 – Maximum Construction Tolerances

Component	Attribute	Tolerance
Plastic flexible pipes	Location (plan)	Within 200 mm of the plan position specified or shown on the Drawings at any point.
	Invert level	Within 20 mm of the design level at any point.
	Deflection (vertical)	4 % of the diameter prior to installation unless at any elastomeric seal joint.
		To comply with the relevant Standard or Specification in accordance with Clause 2.1 for elastomeric seal joints.
Trenches		When measured horizontally at any point within the trench at right angles to the line of the pipes:
	Position of trench face:	Within 100 mm of the design location.
	Excavation width:	No less than the specified width. No more than the specified width plus 100 mm.

The tolerances in Table R23.1 apply to the amended set out directed by the Principal or proposed by you and accepted by the Principal.

The Contractor shall test completed uPVC stormwater pipes for ovality. The test of ovality shall be undertaken by you in the presence of the Principal's representative at least 14 days after

compaction of completed backfill. Pipes not meeting the tolerances shall be rectified at your expense and retested.

Undertake inspections of the pipes after the completion of Backfill and after being subject to construction loadings, these pipelines must comply with the requirements of the relevant Clause of RMS R11.

6 COMMISSIONING

No pipe must be placed in service before you have removed all contaminants such as transport and storage materials and construction debris.

ANNEXURE R23/A – (NOT USED)

ANNEXURE R23/B – MEASUREMENT AND PAYMENT

Payment for the activities associated with completing the work detailed in this Specification is made in accordance with the following Pay Items.

A lump sum price for these items will not be accepted.

If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it will be deemed that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

Payment for associated works covered by other Specifications must be made in accordance with the relevant Specification, as listed in Table R23/B.1.

Table R23/B.1 – Other Specifications Covering Associated Works

Work	Specification
Measures to control erosion and sedimentation. Flexible plastic pipes laid as low flow outlets.	RMS G38 or RMS G39
Removal and stockpiling of top soil that is measured and paid in accordance with the EARTHWORKS Specification.	RMS R44
Construction of other stormwater drainage structure components.	RMS R11

Pay Item R23P1 - Excavation for Plastic Flexible Pipes

The unit of measurement is the cubic metre measured as bank volume of the excavation of all types of materials for plastic flexible pipes after removal of topsoil required by the EARTHWORKS Specification.

No payment will be made for any additional material or work as a result of over-excavation.

Payment will include the costs of stripping and stockpiling of topsoil, the disposal of surplus materials where it is not paid in accordance with the EARTHWORKS Specification and the installation and removal of trench support systems.

The width for payment will be that shown on the Drawings, or where no dimension is shown, the minimum width defined by Figure 3.1 of AS/NZS 2566.1 for a single pipe and multiple pipes installed side by side. The external pipe diameter is measured at the barrel. Measurement must exclude the allowances stated in the Figure 3.1 footnotes and quantities paid in accordance with the RMS R11 pay items. The sides of the trench must be taken as vertical.

The length for payment will be the actual excavation length.

The depth for payment will be the average actual depth excavated except that it must not exceed the maximum depth for payment specified in Table R23/B.2.

Table R23/B.2 – Maximum Depth for Payment

Location	Installation Condition	Maximum Depth for Payment
Cuttings	Trench	The average difference in level between the Design Floor Level of the cutting and the bottom of the Embedment Zone.
Embankments	Embankment	The average difference in level between the natural ground surface stripped of topsoil and the bottom of the Embedment Zone.
Embankments	Trench	The average difference in level between the level of the part-completed embankment and the bottom of the Embedment Zone.
Other areas	Trench	The average difference in level between the natural ground surface stripped of topsoil and the bottom of the Embedment Zone.

Pay Item R23P2 - Unsuitable Material

This pay item covers the payment for excavation and removal of unsuitable material. However, the payment for the replacement of unsuitable material will be as detailed in Specification RMS R44.

The unit of measurement is the cubic metre measured as the volume of material which is directed by the Principal to be removed and replaced. Where the side of trenches are composed of material which the Principal determines is unsuitable, the volume for payment will include the volume of the trench when backfilling and re-excavation of the trench is necessary.

Measurement must exclude quantities paid in accordance with the RMS R44 pay items.

The schedule quantity is a provisional quantity.

Pay Item R23P3 - Plastic Flexible Pipes

The unit of measurement is the linear metre measured along the centreline of each type of plastic flexible pipe and must be the length actually laid.

The schedule rate must include:

(i) supply of pipes and fittings and all other materials;

(ii) installation and compaction of Embedment Material and Backfill;

(iii) laying and jointing;

(iv) provision of anchor blocks;

(v) supply and placing subsurface pipes and filter fabric at pits, headwalls and wingwalls; and

(vi) inspection after completion of the selected material zone, rectifying any damage, and reporting.

Separate rates must be given for each type, size and class of pipe.

ANNEXURE R23/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.2.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Clause	Type	Description
2.2	Hold	Incorporation into the Works of plastic flexible pipe and fittings.
4.3	Witness	Excavation for plastic flexible pipes being installed in accordance with AS/NZS 2566.1.

Also implement for pipes installed in accordance with this Specification, the HOLD POINTS specified in RMS R11 in relation to:

(a) construction of each drainage system after setting out;

(b) replacement of unsuitable material; and

(c) travelling construction plant or vehicles over pipes before adequate cover has been placed.

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS Q Annexure Q/E.

Clause	Description of the Identified Record
2.2	Certificates, verifying that the plastic flexible pipes and fittings comply with the requirements of this Specification.
4.2	Drainage system set out as specified in RMS R11
4.5	Procedure for ensuring adequate compaction in the Embedment Zone around the plastic flexible pipes.

ANNEXURE R23/D – PLANNING DOCUMENTS

Refer to Clause 1.2.3.

The PROJECT QUALITY PLAN and its references must, as a minimum, include the following, when applicable.

Clause	Description
4.5	Procedure for ensuring adequate compaction in the Embedment Zone around the plastic flexible pipes.

ANNEXURES R23/E TO R23/K – (NOT USED)

ANNEXURE R23/L – SAMPLING AND TESTING PROCEDURES

Refer to Clause 1.2.4.

Table R23/L.1 – Minimum Frequency of Testing

Clause	Characteristic Analysed	Test Method	Minimum Frequency of Testing
2.1	Plastic flexible pipes and fittings: - performance requirements	In accordance with the relevant material Standard or Specification.	In accordance with the relevant material Standard or Specification.
2.3	Embedment Material: - particle size distribution	RMS T201	One per 50 cu m or part thereof prior to placement.
2.3	Embedment Material: - plasticity	RMS T109	One per 100 cu m or part thereof prior to placement.
4.5(a) 4.5(b)	Compaction: - selected material zone - foundations and fill material	In accordance with R44	In accordance with the requirements of RMS Q Annexure Q/L3.

ANNEXURE R23/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

RMS Specifications

RMS G2	General Requirements
RMS Q	Quality Management System
RMS R11	Stormwater Drainage
RMS R44	Earthworks

RMS Test Methods

RMS T109	Plastic Limit and Plasticity Index of Road Materials
RMS T119	Determination of Density of Road Materials in Situ using the Sand Replacement Method
RMS T166	Determination of Relative Compaction
RMS T173	Determination of Field Dry Density and Moisture Content of Pavement Materials using a Nuclear Gauge in Direct Transmission Mode
RMS T201	Sieve Analysis of Aggregates

Australian Standards

AS 1254	Unplasticized PVC (UPVC) pipes and fittings for storm and surface water applications
AS/NZS 2566.1	Buried flexible pipelines - Structural design
AS/NZS 2566.2	Buried flexible pipes - Installation
AS 3518 1	Acrylonitrile butadiene styrene (ABS) pipes and fittings for pressure applications - Pipes
AS 3518 2	Acrylonitrile butadiene styrene (ABS) pipes and fittings for pressure applications - Solvent cement fittings
AS 3571	Glass filament reinforced thermosetting plastic (GRP) pipes - Polyester based - Water supply, sewerage and drainage applications
AS 3572	Plastics - Glass filament reinforced plastic (GRP) - Methods of test
AS 4441 (Int)	Oriented PVC (PVC-O) pipes for pressure applications
AS/NZS 5065	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
ISO 9001	AS/NZS ISO 9001 - Quality management systems - Requirements