Vinidex by aliaxis

SewerPRO® Installation Guide

LIGHT WEIGHT

EASY TO HANDLE - COST EFFECTIVE TO INSTALL

SIMPLE & EFFECTIVE JOINTS

ADAPTS TO SOIL MOVEMENT

DOMESTIC OR INDUSTRIAL APPLICATIONS

USED IN AGGRESSIVE OR SALINE SOILS

Certified System™
Quality
ISO 9001
Lic 570
SAI GLOBAL

SEWERPRO® INSTALLATION GUIDE

INTRODUCTION

Vinidex SewerPRO® pipes are twin-wall, corrugated polypropylene pipes for sewerage applications, and can be installed in non-trafficable and trafficable areas, including under road pavements.

Using modern co-extrusion techniques, SewerPRO® is manufactured with a smooth bore for optimum hydraulic performance and a corrugated outside wall for high stiffness to weight ratio.

By combining the strength and toughness of advanced polypropylene materials with the structured wall design, SewerPRO® pipes provide an environmentally sensitive, cost-effective piping system for sewerage applications in sizes from DN150 to DN900.

SewerPRO® pipe is available in standard rubber ring jointed spigot/socket configuration (Sp/So) in 3m nominal length.

This guide is intended to provide general information for the safe installation, maintenance and repair of Vinidex SewerPRO® pipes. For more detailed information refer to AS/NZS 2566.2 “Buried flexible pipelines. Part 2: Installation”.

When designed and installed correctly, Vinidex SewerPRO® systems will provide continuous service for 100 years.

Table A: SewerPRO pipe dimensions

Vinidex Code	Nominal Diameter (mm)	Product Description	Effective Length (m)	Mean Pipe Outside Diameter (mm)	Mean Pipe Inside Diameter (mm)	Approximate Pipe Mass (kg/length)
29480	150	150 SewerPRO2 SN10	2.95	169	148	5
29457	225	225 SewerPRO2 SN10	2.92	259	226	10
29459	300	300 SewerPRO2 SN10	2.87	343	300	16
29461	375	375 SewerPRO2 SN10	2.86	428	374	25
29472	450	450 SewerPRO2 SN10	2.86	514	448	38
29474	525	525 SewerPRO2 SN10	2.80	600	523	49
29476	600	600 SewerPRO2 SN10	2.75	682	596	63
29427	750	750 SewerPRO2 SN10	2.82	835	731	98
29428	900	900 SewerPRO2 SN10	2.81	999	873	134

INSTALLATION

Flexible Pipes

Vinidex SewerPRO® is a flexible pipe. This means that as vertical loads are applied, the pipe will deflect and take advantage of horizontal soil pressure to provide additional support to the system. The interaction of the pipe and the embedment material means that both play an important role in the structural performance of the pipeline.

Flexible pipes have shown excellent performance in buried applications and have been thoroughly researched in both field installations and laboratory studies.

Well-installed pipes, in which the specified embedment material is placed and compacted to the required level, have characteristically low deflections because the pipe deflection follows the soil settlement.

After initial compaction and settlement, applied vertical loads have very little effect on deflection. The use of flexible pipes in all buried applications including under road pavements is well established in Australia and throughout the world.

Where SewerPRO® pipes are installed at depths between 0.8m and 6m in normal soils and recommended installation practices are followed there is generally no need for structural design calculations. In these typical installations, deflection can be reliably predicted from a design chart based on the compaction level of the embedment.

For installation conditions at greater depths or in poor soils, a design methodology for flexible pipes is clearly set out in AS/NZS 2566.1 “Buried flexible pipelines. Part 1: Design”. This Standard uses the pipe characteristics and material properties, installation conditions and external loads to predict pipe deflection, strain in the pipe wall and resistance to buckling which are compared against conservative allowable limits.

Handling & Storage

SewerPRO® pipes are relatively light weight and smaller sizes can be lifted manually. Note that correct PPE and safe lifting practices should always be used. Care should also be taken when pipes are loaded, unloaded, stacked or distributed on sites to avoid damage to the pipe.

When pipes are lifted mechanically, approved and certified web or rope slings should be used. Transport should not have sharp projections which could cause damage to pipes. Pipes should not be dragged along the ground as this can damage the pipe, causing difficulty with jointing and testing.

SewerPRO® pipes should be stacked on flat firm ground, which has been cleared of debris and hazardous combustible vegetation. Pipes should be laid flat on transverse bearers at least 75mm wide at maximum 1.5m centres.

Pipe sockets should be supported so that the ends are free from loading, with sockets in each layer opposite to the previous layer. Different sizes are best stacked separately. If this is not practical, then stack with the largest pipes at the base. Framed crates must be stored timber on timber (sizes 150, 225 and 300 only). The height of the pipe stacks should be limited to prevent distortion and excessive ovalisation.

If pipes are to be nested (smaller diameter pipes stored inside larger diameter pipes) for long periods, stacks should not exceed 2m in height.

Prior to installation, all pipes should be inspected for serious defects. Serious defects are defined as:

- scratches in the inner or outer wall greater than 2mm deep; or
- a hole in the inner or outer wall; or
- any damage to the spigot or socket that could compromise the joint integrity

Any pipes found to have serious defects should be quarantined for replacement. Other minor defects that will not affect the long term integrity of the pipeline require no repairs.

Trench Excavation

All trenches are potentially dangerous and proper care should be taken to ensure the stability of the trench wall and the safety of all workers. The trench should not be excavated too far in advance of pipe laying and should be backfilled as soon as possible.

Minimum Trench Width

The trench width should be as narrow as is practicable, but wide enough to allow adequate compaction of the haunch zone and the making and inspection of joints. AS/NZS 2566.2 sets out the minimum trench dimensions for SewerPRO® as shown in Table B.

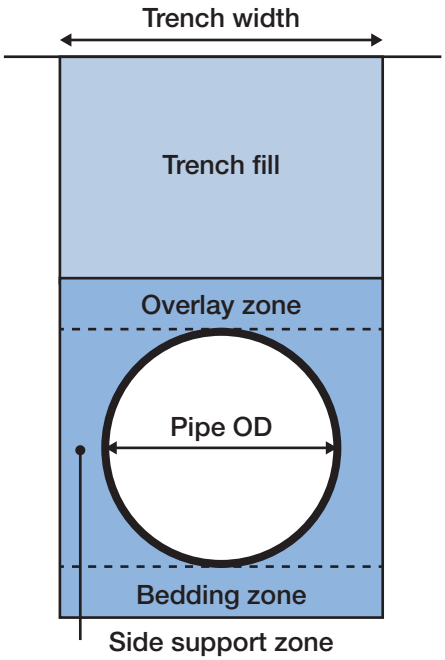


Table B: Minimum trench dimensions

Nominal Diameter (mm)	150	225	300	375	450	525	600	750	900
Minimum Trench Width (mm)	470	560	745	830	1115	1200	1280	1435	1700
Minimum Depth of Bedding Zone (mm)	100	100	100	100	150	150	150	150	150
Minimum Depth of Overlay Zone (mm)	150	150	150	150	150	150	150	150	200

Pipes in Parallel

Where pipes are laid in parallel, the minimum spacings between pipelines are given below.

Table C: Minimum spacings between parallel pipelines

Nominal Diameter (mm)	Minimum Spacing (mm)
150	150
225	150
300	200
375	200
450	300
525	300
600	300
750	300
900	350

Selection of Embedment Material

Embedment material for SewerPRO® pipes should preferably be granular, free-flowing material. This type of embedment material requires less compactive effort to provide support for the pipe and minimises soil settlement.

The table below provides typical gradings for single-size aggregates suitable for use as embedment material for SewerPRO®.

Table D: Typical aggregate grading

SIEVE SIZE (mm)	% PASSING BY MASS Nominal size of single-size aggregate 10mm	7mm	5mm
26.5	-	-	-
19	-	-	-
13.2	100	-	-
9.5	85-100	100	
6.7	-	85-100	100
4.75	0-20	-	85-100
2.36	0-5	0-20	0-40
0.075	0-2	0-2	0-2

Where sand is more readily available, a typical sand grading is shown below.

Table E: Typical sand grading

SIEVE SIZE (mm)	% PASSING BY MASS
4.75	100
2.36	90-100
1.18	85-100
0.6	70-100
0.3	50-100
0.15	0-40
0.075	0-5

In cases of reduced cover, it may be preferable to use a cement stabilised sand/gravel as the embedment material (including bedding, side support and overlay zones). According to Table L2 of AS/NZS 2566.2, the cement stabilised material should have a cement content of 6-10%, a moisture content of 10%, and have an unconfined compression strength of 1.7MPa, as determined from cylinder specimen at 7 days.

In cases where it is difficult to achieve mechanical compaction of the bedding material, controlled low strength material (CLSM) may be used as an alternative material. CLSM, also known as slurry fill, flowable fill, flowable mortar, soil-cement slurry, unshrinkable fill or controlled density fill, should achieve a compressive strength in the range of 0.6 MPa to 3.0 MPa, depending on cement content.

When placing CLSM, care should be taken to prevent flotation of the pipe by selecting a lift thickness appropriate to the diameter of the pipe, or ballasting the pipe with sandbags. Further details are available in Appendix K of AS/NZS 2566.2.

Placing and Compacting Embedment Material

The embedment material should be placed and graded to invert level, and compacted to a minimum 95% Modified Maximum Dry Density or 70% Density Index, depending on the selected material. In conditions where the trench bottom is wet, soft or irregular, it may be necessary to first stabilise, fill and level, and compact the base. Place and compact material in the pipe bedding zone to minimum depth of 75mm beneath the pipe.

Side support and overlay material should be placed in a manner to ensure:

a. uniform distribution and compaction of embedment material, especially under the haunches of the pipe;
b. the material relative compaction is consistent with design;
c. pipe distortion is minimized;
d. the pipe is not damaged; and
e. the specified pipe alignment, level and grade is maintained

In order to ensure uniform support along the pipe barrel, a small indentation should be excavated in the pipe bedding zone to accommodate the pipe sockets.

The pipe side support material should be placed evenly on both sides of the pipeline and compacted such that relative compaction is consistent with design. Side support material should be worked under the sides of the pipe to minimise voids and provide maximum pipe haunching, taking care to minimise distortion of the pipe and maintain alignment and grade.

The pipe overlay material should be levelled and compacted in layers, to a minimum height of 150mm above the crown of the pipe, or as specified.

Cutting of Pipes

DN150 to DN600 SewerPRO® pipes may be cut anywhere along their length as required, always ensuring that safe work practices are followed. The cut should be made in the valley between the corrugations at right angles to the axis of the pipe. No end treatment or chamfer is required.

SewerPRO® pipes can be safely cut using any saw suitable for cutting timber. This can be a manual or powered saw.

Due to the reduced spigot diameter, cutting of DN750 and DN900 SewerPRO® pipe is not recommended unless absolutely necessary. Special slip couplings and rubber rings are required to connect cut DN750 and DN900 SewerPRO® pipe.

Jointing

SewerPRO® pipes have a simple and effective rubber ring joint system which is easy to assemble, leaktight and protects against tree root intrusion.

Vinidex PRO2 is a new jointing system designed for easier installation and leak tight joint performance. The PRO2 joint design uses a new redesigned rubber ring to match new socket geometry. Ensure that only PRO2 rubber rings are used with PRO2 sockets. PRO2 sockets can be identified by a label on the socket and PRO2 rubber rings can be identified by PRO2 marking on the ring.

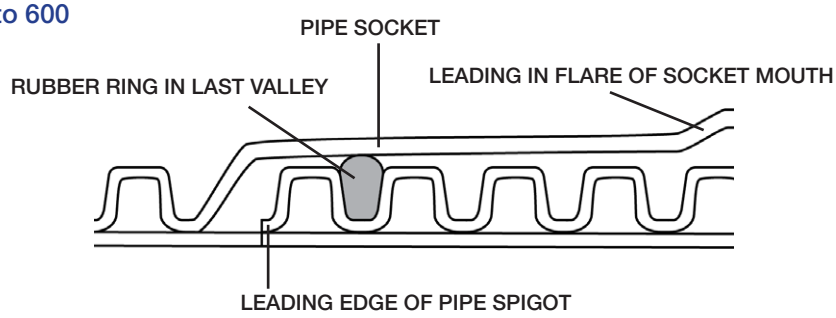
For DN150 to DN600 pipes, the rubber ring is located on the spigot in the last valley between the corrugations.

For DN750 and DN900 pipes, two rings are used and are located in the first two valleys. The ring in the first valley is the sealing ring whereas the second ring is a mechanical support ring which has the dual benefit of providing redundant sealing capacity.

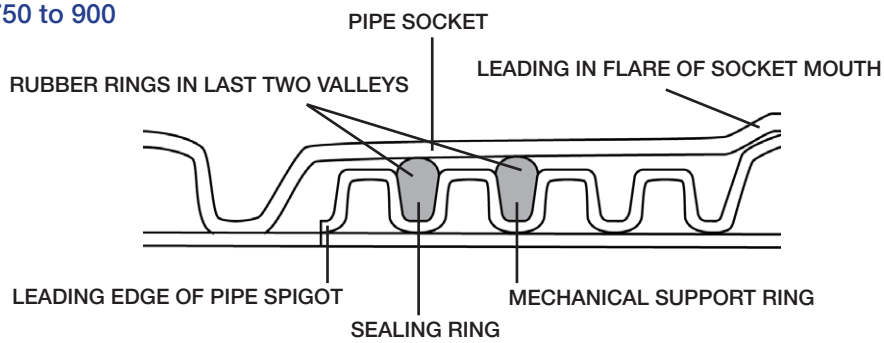
The Figure below shows the joint details in cross section.

Figure B: Joint cross section

DN150 to 600



DN750 to 900



The following procedure is recommended when jointing SewerPRO® rubber ring jointed pipes:

1. Clean the pipe socket and spigot end, making sure both are free of any dirt and grit. Any foreign matter trapped in the joint will compromise joint performance and leaktightness of the system.

2. For DN150 – DN600 - Install the rubber ring by stretching it over the spigot so that it seats between the first and second corrugations from pipe spigot end.

   For DN750 and DN900 pipes – Install two rubber rings, one in the valley between the first and second corrugations and one in the adjacent valley between the second and third corrugations from the spigot end.

3. Ensure rubber rings are evenly fitted by running fingers around the full circumference of the pipe.

4. Apply a generous quantity of Vinidex jointing lubricant to the inside of the receiving socket. Do not lubricate the rubber ring or the valley under the rubber ring. Avoid getting lubricant under the rubber ring. This will ensure that the ring does not pick up dirt and introduce contaminants to the joint or become displaced during jointing.

HINT: To further minimize the risk of introducing grit from the embedment material into the joint, a small piece of rubber mat, poly tarp or equivalent can be temporarily placed under the socket/spigot during joint assembly.

5. Insert the leading edge of the spigot into the receiving socket. It is essential that pipes are in a straight line before attempting to make the joint. Double check that the ring and spigot is free from any grit or embedment material so as not to compromise the joint.

6. Do not apply jointing force directly to the socket. Insert a short stub of pipe in the opposite socket. The short stub can be an off-cut, 50mm longer than the socket, and can be re-used.

7. Apply even jointing force. Subject to pipe diameter and local conditions, use a crowbar (see Note) to push on a timber block on the end of the short pipe.

8. Push home the pipe until the spigot end comes into contact with the inner wall of the socket.

NOTE: The jointing force required increases with the nominal diameter of the pipe. A leverage tool such as a crowbar is generally sufficient for SewerPRO® pipes up to 375mm nominal diameter. For larger sizes, mechanical assistance is required. Where applying a jointing force is not practical, consideration should be given to the use of come-along or winch and rope devices.

Angular Deflection
The pipe may be deflected at the joint after jointing has been completed. Any deflection should be limited to a maximum of 1°.

Witness Mark
The rubber ring is held in position by the corrugations. When the joint is assembled, the inner walls of the pipe butt together so it is not necessary to joint to a witness mark in the same way as it is for pipe joints designed with a laying gap. However, if required as a visual indication of correct jointing depth, a witness mark can be applied to the spigot end.

Depending on manufacturing tolerances, a witness mark on the crest of the 5th rib for sizes DN150 to DN300 and on the crest of the 4th rib for sizes DN375 to DN900 will be either wholly within the socket, or just visible at the mouth at the completion of jointing.

Internal Lining
When the SewerPRO® pipe is pushed fully home during assembly, the spigot end and the internal lining at the back of the socket are generally in contact. However, due to manufacturing tolerances or where there is angular deflection at the joint a small gap may sometimes be observed. This has no effect on the sealing capability of the joint.

Backfilling
Where the finished surface is not to be paved, and surface settlement is not considered critical, ordinary fill material is suitable up to the finished surface. Under pavements where settlement of the fill material is to be controlled, a fill material that can be compacted to the required density should be used.

Trench fill should be placed on the pipe overlay and compacted as specified but generally not in layers in excess of 300mm. Complete the backfilling operation to finished surface level.

Allowable Cover
Minimum cover in Table F reflects industry standards for various design load cases.

Table F: Minimum depth of cover over pipe

Loading Condition	Minimum Cover (m)
Not subject to vehicular loading	0.30
Land zoned for agricultural use	0.60
Subject to vehicular loading: (a) no carriageway (b) sealed carriageways (c) unsealed carriageways	 0.45 0.60 0.75
Pipelines in embankments or subject to construction equipment loads	0.75

Construction Loads

During construction, consideration of loading during placement and compaction of fill around the pipe and any other construction loading is critical. Care must be taken to ensure that any construction loading from trench compaction and road construction equipment does not overload the pipe.

The following minimum depths of compacted fill over the pipe apply for the placement and compaction of fill around of SewerPRO®.

Table G: Minimum depths of compacted fill over SewerPRO® for construction loads

Construction Load	Minimum compacted fill over SewerPRO
Pedestrian vibrating plate	200mm
Vibratory rammer (up to 75kg)	250mm
Vibratory trench roller (up to 2t)	250mm
Vibratory smooth drum roller (7t)	500mm
Truck and dog trailer	500mm
25 tonne excavator and 580 mm compaction wheel acting separately	1,000mm

Flotation

The possibility of pipe flotation exists when SewerPRO® is installed in areas which will be inundated, such as creek crossings, flood plains and high groundwater areas. To prevent flotation, a minimum cover equivalent to 75% of the nominal diameter is required.

Concrete Encasement

Where concrete encasement is required, SewerPRO® pipes should be laid to the correct alignment and grade, supported on hessian bags filled with stabilised sand or on concrete blocks or cradles. The concrete surround should be placed so as to provide uniform and continuous support around the entire circumference of the pipe.

SewerPRO® joints for concrete encasement should be made with an additional rubber ring. For pipe sizes up to and including DN300, a gap should be left and the extra ring placed in the valley between the third and fourth corrugations from the spigot end. For sizes DN375 and greater, the second ring should be placed adjacent to the first ring in the valley between the second and third corrugations. DN750 and DN900 have rings in the first two valleys as usual. Table H outlines placement of additional rings.

The completed joint should also be sealed with tape to prevent concrete entering the socket during encasement.

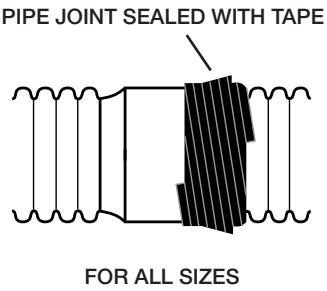


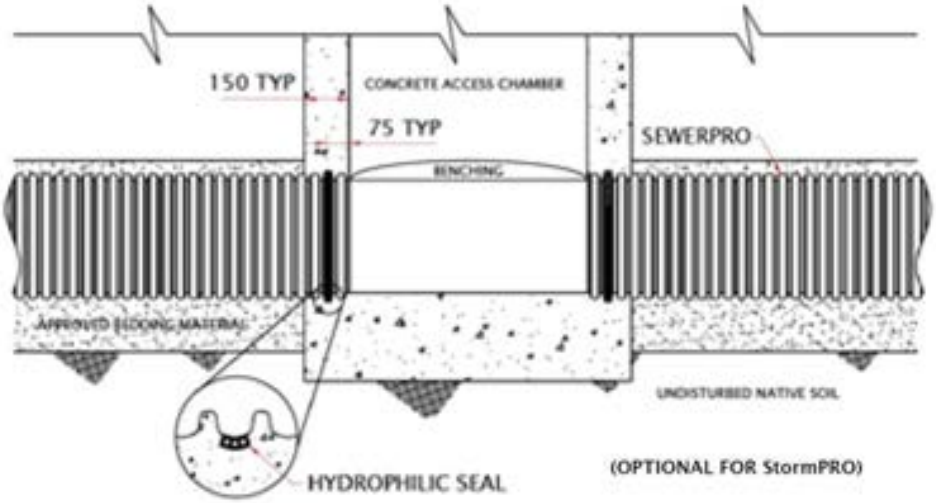
Table H: Placement of additional rubber ring for concrete encasement

DN150 to DN300	DN375 to DN600	DN750 to DN900
		

The pipe shall be restrained and care taken to prevent movement, misalignment, distortion and / or flotation during the encasement process.

Connection to Structures

SewerPRO® pipes may generally be connected to rigid structures such as pits, headwalls and endwalls, both pre-cast and cast in situ. SewerPRO® pipes have sufficient flexibility and strain tolerance to accommodate differential settlement at the interface. The figure below shows a typical entry or exit to a concrete structure.



Note that the hydrophilic seal is required only where a waterproof seal is critical. When required, use Hydrotite DSS0220 or equivalent.

Connection to Other Pipes

Vinidex offers a range of adaptor couplings to PVC DWV systems.

For larger diameters, in most cases, it is simplest and most economical to transition from SewerPRO® to other pipe types (SRCP, FRC, etc.) at a pit or manhole.

Mine Subsidence

In ground subject to earth movement or in areas affected by underground mining, pipes can be subjected to longitudinal stresses. These stresses can occur at any time after installation and result in axial stress in the pipe. SewerPRO® rubber ring jointed pipe is capable of absorbing significant strains and the pipe joint can also accommodate a certain amount of the strain associated with mine subsidence.

Table I: Allowable Ground Strain % for SewerPRO® pipe (mm/m)

SIZE DN								
150	225	300	375	450	525	600	750	900
4	4.5	7.5	5.5	7	10.5	12.5	6.5	5

NOTE: For SewerPRO® pipes the table represents tensile ground strains withdrawing the spigot from the socket. Further insertion of the joint is not possible as the pipe is fully homed when jointed. Compressive ground strains are likely to result in longitudinal stresses in the pipe wall which will then be subject to stress relaxation with time.

This table assumes that the ground strain is uniformly transferred along the pipe. Pothole subsidence or large localised fissures may result in damage to the pipe or joint.

Bore Casing

When SewerPRO® pipe is installed under roadways and railways, it is a requirement of most authorities to encase the SewerPRO® in a larger diameter encasing pipe. The encasing pipe provides additional structural protection and also allows access for any required maintenance of the SewerPRO®.

Spacers should be fixed to the outside of the SewerPRO® pipe to protect the SewerPRO® during installation and to ensure it is positioned in the centre of the encasing pipe. Spacers can be fabricated from timber and fastened to the pipe with suitable strapping. Proprietary spacing systems are also available.

When the SewerPRO® pipe is in position in the encasing pipe, grouting of the annular space between the two pipes can be carried out if required.

Grouting

Where it is a requirement to grout-fill the annular space between the SewerPRO® and encasing pipe, care should be taken to ensure that the grout flow remains constant. The grout pressure should not exceed 70 kPa to prevent buckling of the pipe. If higher grout pressures are required, it will be necessary to fill the pipeline with water.

Flotation may be an issue for pipes larger than DN600, where it is advisable to stage the grouting process in two or three lifts, as detailed in Appendix K of AS/NZS 2566.2.

Field Testing

Leakage testing is carried out to identify installation faults and sources of infiltration and exfiltration in pipelines which are required to be water tight such as sewerage systems. Leakage testing is generally not required for stormwater drains.

It is advisable to begin testing early in the pipeline installation to confirm adequacy of laying procedures and, where appropriate, to increase the length tested progressively as experience is gained.

AS/NZS 2566.2 specifies detailed procedures for leakage testing using hydrostatic testing, air or vacuum testing or infiltration testing of non-pressure pipelines. These methods are summarised below. Notwithstanding this, leakage testing should be carried out in accordance with local authority requirements.

Method 1: Hydrostatic Test

Fill the pipeline with water and pressurise to not less than 20kPa at the highest point of the section being tested, but not greater than 60kPa at the lowest point of the test section. Maintain the test pressure for at least 2 hours by adding measured volumes of water if required. Each joint should be carefully examined visually for leaks, and any defects should be repaired. The pipeline section is deemed satisfactory if the make-up volume is less that 0.5L per hour per metre length per metre diameter. After any repairs, the pipeline should be re-tested.

Method 2: Air Test

Introduce air slowly by suitable means until a pressure of 25kPa is obtained. Maintain for a period of at least 3 minutes. If no leaks are observed after 3 minutes, shut off the air supply. If the pressure of air contained in the pipes under test does not fall below 18kPa within the time period specified in the table below, the pipeline shall be considered satisfactory.

If, however, the pressure is not maintained within the specified limits, reintroduce the air and examine the pipeline for leaks by pouring a concentrated solution of soft soap and water over the joints and fittings. Identify and repair any leaks. After any repairs, the pipeline should be re-tested.

Method 3: Vacuum Test

Apply a vacuum until a negative pressure of 25 kPa is obtained. Maintain for a period of at least 3 minutes. If no leaks are observed after 3 minutes, isolate the test section from the vacuum pump. Monitor the pressure for the time specified in the table below. If the vacuum does not drop below 18 kPa within the specified time period, the pipeline shall be considered satisfactory. Where the pipeline section fails the test, re-apply the vacuum and examine the pipeline for leaks. Identify and repair any leaks. After any repairs, the pipeline should be re-tested.

Method 4: Infiltration Test

Where there is a free standing water table at a height of at least 1.5m above the test section, an infiltration test can be carried out. Observe the pipe for 24 hours. Where infiltration is detected, the leak should be identified and repaired.

Table J: Minimum time intervals for 7kPa pressure change in air and vacuum test

	Minimum Test Duration (min)				
DN	Test Length (m) -50	Test Length (m) -100	Test Length (m) -150	Test Length (m) -200	Test Length (m) -250
150	3	3	3	5	6
225	4	5	8	10	13
300	6	9	14	18	23
375	7	14	22	29	36
450	10	21	31	41	52
525	14	28	42	56	70
600	18	37	55	73	92
750	29	57	86	115	143
900	41	83	124	165	207

Water Jet Cleaning

High-pressure water jet cleaning of internal pipeline surfaces is common, but if not properly managed, water emitted under high-pressure through a jet nozzle has the potential to damage any pipe surface, including those manufactured from plastics, metallic, ceramic and concrete materials.

PIPA Industry Guidelines POP205 provides information based on experience and research, as to the maximum pressures that may be used to avoid damage to SewerPRO® pipes. The guidelines can be downloaded at http://www.pipa.com.au/documents/water-jet-cleaning-plastics-pipes.

Pipe Repair

If SewerPRO® is damaged, the repair method will depend on the nature and severity of the damage. Table K below provides guidance on the most suitable method relative to the extent of damage.

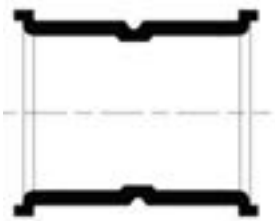
Table K: Suitable methods of pipe repair

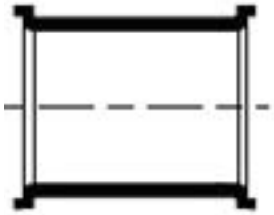
	EXTENT OF DAMAGE	REPAIR METHOD
INTERNAL	Minor damage to inner wall (no penetration)	No repair required
	Penetration of the inner wall	Internal repair sleeve required
EXTERNAL	Minor damage to outer wall (no penetration of the outer corrugated wall)	No repair required
	Minor damage to outer wall (penetration of the outer corrugated wall)	External repair sleeve required
	Penetration of both inner and outer walls	Cut, remove and replace affected section of pipe

Contact Vinidex for a range of repair clamps and fittings for SewerPRO® pipes.

Standard and Slip Couplings

Standard socket/socket couplings and slip couplings are available in all sizes. Refer product catalogue for further information.





Vinidex Pty Limited
ABN 42 000 664 942

HEAD OFFICE
Level 4, 26 College Street
Darlinghurst NSW 2010
PO Box 747, Darlinghurst NSW 1300

Reception: +61 2 8278 0500

CUSTOMER SERVICE
Phone: 13 11 69
Fax: 13 24 43

Email: sales@vinidex.com.au
Web: www.vinidex.com.au

AUSTRALIAN OPERATIONS

Sydney
254 Woodpark Rd
Smithfield NSW 2164

Wagga Wagga
280 Byrnes Rd
Wagga Wagga
NSW 2650

Melbourne
Unit 1, 10 Duerdin St
Notting Hill VIC 3168

231-245 St Albans Rd
Sunshine VIC 3020

Adelaide
9–11 Kaurna Ave
Edinburgh SA 5111

Launceston
15 Thistle St
Sth Launceston TAS 7249

Brisbane
224 Musgrave Rd
Coopers Plains QLD 4108

Townsville
18 Enterprise Ave
Bohle QLD 4816

Toowoomba
Lot 2 Witmack Rd
Wellcamp QLD 4350

Rodney Industries
19 Valente Close
Chermside QLD 4032

Darwin
61 Marjorie St
Pinelands NT 0829

Perth
Sainsbury Rd
O'Connor WA 6163

VIN332-
20190319