Vinidex Pty Ltd

PRODUCT APPRAISAL REPORT 1506

SewerPRO® and StormPRO®
Polypropylene Pipe and Fittings for Non-Pressure Applications

AS/NZS 5065:2005 – Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

Publication Version: 1 April 2016

WATER SERVICES
ASSOCIATION OF AUSTRALIA

Document History

The following information indicates the changes made to this document.

Date	Version	File Location
22 February 2016	Peer Review Draft	U:\PP1 Industry Performance and Regulation\PP1-012 Product Appraisals\Civil Asset Infrastructure\2015\PA 1506 Vinidex - SewerPro SewerMax PP pipe\PA 1506 Report\PA 15_06 Vinidex SewerPRO and StormPRO Peer Review 22022016.docx
1 April 2016	Publication	U:\PP1 Industry Performance and Regulation\PP1-012 Product Appraisals\Civil Asset Infrastructure\2015\PA 1506 Vinidex - SewerPro SewerMax PP pipe\PA 1506 Report\PA 15_06 Vinidex SewerPRO and StormPRO Peer Review 22022016.docx

Peer Reviewers

Name/Title	Organisation	Date
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Approvals

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Carl Radford, Product Appraisal Manager	Carl Radford	1 April 2016

Overview of WSAA

The Water Services Association of Australia (WSAA) is the peak industry body that supports the Australian Urban Water Industry. Its members and associate members provide water and sewerage services to approximately 20 million Australians and many of Australia's largest industrial and commercial enterprises.

The Association facilitates collaboration, knowledge sharing, networking and cooperation within the urban water industry. It is proud of the collegiate attitude of its members which has led to industry-wide approaches to national water issues.

WSAA can demonstrate success in the standardisation of industry performance monitoring and benchmarking, as well as many research outcomes of national significance. The WSAA Executive retains strong links with policy makers and legislative bodies and their influences, to monitor emerging issues of importance to the urban water industry. WSAA is regularly consulted and its advice sought by decision makers when developing strategic directions for the water industry.

WSAA was formed in 1995 as a non-profit organisation to foster the exchange of information relating to the provision of urban water services between industry, government and the community, and to promote sustainable water resource management.

The Association's main activities focus on four areas:

1. Influencing national and state policies on the provision of urban water services and sustainable water resource management;
2. Promoting debate on environmentally sustainable development and management of water resources and the community health requirements of public water supplies;
3. Improving industry performance and establishing benchmarks and industry leading practices for water service processes; and
4. Fostering the exchange of information on education, training, research, water and wastewater management and treatment and other matters of common interest.

CONTENTS

1 EXECUTIVE SUMMARY

This Product Appraisal Report replaces and updates PA 07/10 Issue 1 published in February 2008.

This report introduces a new joint design for the StormPRO® and SewerPRO® range of pipes and fittings. The new design joints can be identified by PRO2 marking.

The new joint design involves the following improvements:

- parallel socket profile;
- reduced socket to spigot clearance;
- increased overall socket length;
- stiffened geometry at lead in of socket; and
- simplified elastomeric seal profile.

The improved joint design results in easier installation and enhanced joint performance under adverse soil movement and deflection conditions. The PRO2 joint design uses a new redesigned elastomeric seal to match new socket geometry. PRO2 sockets should only be joined using PRO2 elastomeric seals. PRO2 sockets can be identified by a label on the socket and PRO2 elastomeric seals can be identified by PRO2 marking on the elastomeric seals.

The new PRO2 joint for SewerPRO® and StormPRO® pipe is not compatible with the original socket or elastomeric seals. It is important to use Vinidex fittings labelled PRO2 with Vinidex PRO2 pipes to ensure dimensional compatibility and system performance.

To connect to existing SewerPRO® and StormPRO® sockets which have already been installed, the original elastomeric seal is required, and limited stocks of the original elastomeric seals are available from Vinidex. When connecting to existing SewerPRO® and StormPRO® sockets it is preferable that the connection be made using the existing SewerPRO® and StormPRO® spigot inserted into the new PRO2 socket using PRO2 elastomeric seals.

Vinidex now uses only Hultec elastomeric seals for both StormPRO® and SewerPRO® polypropylene pipes and associated fittings.

Each length of SewerPRO® and StormPRO® pipe is supplied with an elastomeric seal. SewerPRO® and StormPRO® pipe is available in standard elastomeric seal jointed Spigot / Socket configuration.

Vinidex StormPRO® and SewerPRO® twin walled corrugated polypropylene pipe is manufactured in Wagga Wagga NSW for sewerage and drainage non-pressure applications. These pipes can be installed in non-trafficable and trafficable areas, including under road pavements.

StormPRO® (SN8 - black) and SewerPRO® (SN10 - dark grey) spigot-socket elastomeric jointed pipe is available in 6m and 3m nominal lengths respectively, in sizes 150mm, 225mm, 300mm, 375mm, 450mm, 525mm, 600mm, 750mm and 900mm nominal diameter.

StormPRO® and SewerPRO® are manufactured in accordance with AS/NZS 5065:2005 *Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications* by continuous dual extrusion, combined with a block mounted vacuum forming process. The pipe is comprised of a smooth, plain inner polypropylene wall and a corrugated outer polypropylene wall, simultaneously extruded. The outer wall is fused to the inner wall for the full circumference of the pipe at the valley of each corrugation.

The fittings covered by this appraisal include a range of SewerPRO® DN 150 injection moulded PP fittings, classified as SN10 with a minimum stiffness of 10,000 N/m/m. The range includes DN 150 x 45° Junctions, DN 150 x 88° Junctions, DN 150 Sewer Tee, DN

150 x 45° and DN 150 x 90° bends, DN 150 push on cap, DN 150 sewer inspection tee assembly and DN 225 push on cap.

Vinidex also supplies the other fittings, intended for joining to StormPRO and SewerPRO® PP pipe, which are not included in the scope of this appraisal: These fitting are classified as:

a) Fabricated PP fittings (from SewerPRO® PP pipe) of size > DN 450

b) Rotational moulded PE fittings of size ≥ DN 450.

c) Fabricated PVC fittings from PVC-U DWV pipe of sizes (DN150 to DN375)

d) A range of transition fitting suitable for joining different pipeline system are also available.

e) Stainless steel repair clamps and sewer OB junction clamps (clamps with oblique offtakes.

For exact details and availability, refer to Appendix A.

Plastics pipe systems are often designed on the basis of 50 year extrapolated test data. This is established international practice but is not intended to imply the service life of drainage pipe is limited to 50 years. For correctly manufactured and installed systems, the actual life cannot be predicted, but can logically be expected to be well in excess of 100 years before major rehabilitation is required.

1.1 Recommendations

It is recommended that WSAA members, subject to any specific requirements of the member, accept or authorise:

a) SewerPRO® (SN 10) sewer pipe and nominated fittings provided sewer pipeline design, installation, acceptance testing and commissioning are in accordance with the manufacturer's recommendations and WSA 02 Sewerage Code; and

b) StormPRO® (SN 8) pipe for drainage pipelines subject to design, installation, acceptance testing and commissioning are in accordance with manufacturer's recommendations and agency requirements.

2 THE APPLICANT

Vinidex is an Australian manufacturer of thermoplastic pipe and fittings systems. Vinidex manufactures and distributes plastic piping systems used in the transportation of fluids, energy and data for infrastructure development, agriculture, mining and building.

Founded in 1960, Vinidex now has factories and distribution centres located in Sydney, Melbourne, Brisbane, Townsville, Launceston, Perth, Adelaide, Darwin and Mildura. The company also has a significant presence in the Asia-Pacific Rim, with operations in China and Hong Kong. Vinidex is committed to ISO 9000 Quality Management Systems and continuous improvement throughout the company.

On 1st August 2014, Vinidex was acquired by the Aliaxis group of companies. The Aliaxis Group is a leading global manufacturer and distributor of primarily plastic fluid handling systems used in residential and commercial construction, as well as in industrial and public infrastructure applications. Vinidex is now wholly owned by Aliaxis Australia Holdings Pty Ltd.

Key Aliaxis Group facts:

- Head office in Brussels, Belgium
- Family owned
- €2.9 billion annual revenue
- Presence in 40 countries

- Over 100 manufacturing and commercial entities
- Employs 15,700 people around the world
- Aliaxis Group brands worldwide

3 THE PRODUCT

This appraisal applies to the Vinidex StormPRO® and SewerPRO® twin walled corrugated polypropylene pipe manufactured in Wagga Wagga, NSW and range of fittings specified in Clause 4.

The Vinidex StormPRO® and SewerPRO® twin walled corrugated polypropylene pipe and fittings are manufactured to AS/NZS 5065:2005 *Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications,* complying with the dimensional requirements of Type B pipes – ID series.

Vinidex StormPRO and SewerPRO pipes are manufactured from PP-B materials.

StormPRO® and SewerPRO® are manufactured by continuous dual extrusion, combined with a block mounted vacuum forming process. The pipe is comprised of a smooth, plain inner polypropylene wall and a corrugated outer polypropylene wall, simultaneously extruded. The outer wall is fused to the inner wall for the full circumference of the pipe at the valley of each corrugation.

The corrugation process involves aluminium mould blocks mounted on a carrier system as shown in Figure 1 below. Each block provides vacuum and cooling to form the corrugated outer profile.

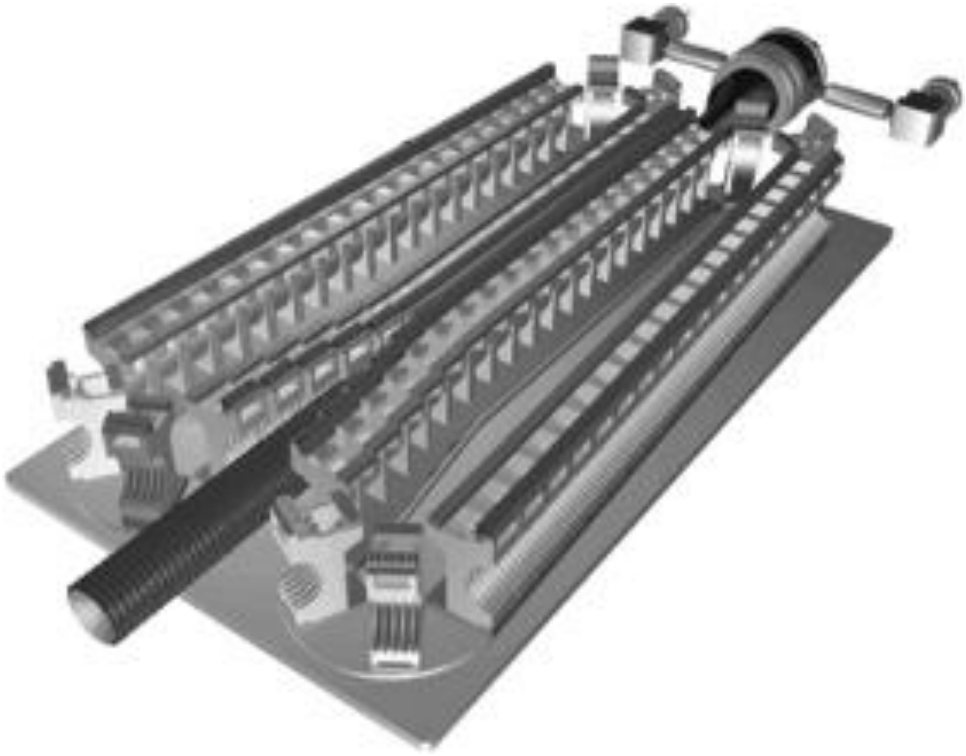


FIGURE 1: CORRUGATION PROCESS INVOLVING ALUMINIUM MOULD BLOCKS MOUNTED ON A CARRIER SYSTEM

Sockets are formed using special socket mould blocks placed at the desired interval (3m or 6m).

Vinidex StormPRO® and SewerPRO® polypropylene (PP) pipes have a smooth bore and corrugated external wall. The pipes are made using a block copolymer polypropylene compound. Whilst sharing many characteristics with polyethylene, the PP used in profile walled pipes has a much higher modulus and is used to make pipes with high ring bending stiffness. The PP material exhibits excellent abrasion resistance and broad chemical resistance.

PP does differ slightly from PE in respect to stress relaxation under constant strain. Whilst both materials exhibit rectilinear behaviour, the rectilinear part of the curve starts at about 1,000 hours for PP and in about 10 – 100 hours for PE. This simply means PP must be tested for a longer period before determining the long term modulus by extrapolation.

The material properties provided by Vinidex for their StormPRO® and SewerPRO® polypropylene (PP) pipes are shown in Table 1.

TABLE 1: TYPICAL STORMPRO® AND SEWERPRO® MATERIAL PROPERTIES[1]

Property	Description Value	Standard
Polypropylene (PP) Pipe compound	BorECO™ BA212E	AS/NZS 5065
Density	900 kg/m^3	ISO 1183
Short-term ring bending modulus (E_b)	1300 MPa	ISO 178
Long-term ring bending modulus (E_{bL2y})	640 MPa	ISO 178
Long-term ring bending modulus (E_{bL50y})	470 MPa	ISO 178
Creep ratio (2 years)	3	ISO 9967
Pipe ring bending stiffness StormPRO®	8,000 N/m/m	AS/NZS 1462.22
Pipe ring bending stiffness SewerPRO®	10,000N/m/m	AS/NZS 1462.22
Poisson's ratio	0.45	ISO 527-2
Coefficient of thermal expansion	15 x 10 $^{-5}$/°C	ISO 11359-2
Tensile stress at yield (50mm/min)	31 MPa	ISO 527-2
Tensile strain at yield (50mm/min)	8%	ISO 527-2
Charpy Impact strength – notched (+ 23°C) (- 20°C)	50 kJ/m^2 5 kJ/m^2	ISO 179/1eA
Melt flow rate	0.3g/10 min	ISO 1133
Hardness	60	ISO 868
Melting Point	130-170°C	

NOTE 1: Refer to PIPA POP15 document for more material properties for StormPRO® and SewerPRO® when undertaking the structural design of buried flexible pipes.

3.1 Vinidex Range of StormPRO® and SewerPRO® pipeline systems

The product range submitted for appraisal consists of:

a) StormPRO® pipes classified as SN8 with a minimum stiffness of 8,000 N/m/m and are available in 6m lengths in sizes from DN 150 to DN 900. StormPRO® pipes have a black external surface and a light grey internal surface.

b) SewerPRO® pipes, classified as SN10 with a minimum stiffness of 10,000 N/m/m and are available in 3m lengths in sizes from DN 150 to DN 900. SewerPRO® pipes are dark grey outside and light grey inside.

c) SewerPRO® DN 150 injection moulded PP fittings, classified as SN10 with a minimum stiffness of 10,000 N/m/m. The range includes DN 150 x 45° Junctions, DN 150 x 88° Junctions, DN 150 Sewer Tee, DN 150 x 45° and DN 150 x 90° bends, DN 150 push on cap, DN 150 sewer inspection tee assembly and DN 225 push on cap.

Vinidex also supplies other fittings, intended for joining to StormPRO and SewerPRO® PP pipe, which are not included in the scope of this appraisal: These fitting are classified as

a) Fabricated PP fittings (from SewerPRO® PP pipe) of size > DN 450 manufactured by Rodney Industries.

b) Rotational moulded PE fittings of size ≥ DN 450, manufactured by Rotadyne.

c) Fabricated PVC fittings from PVC-U DWV pipe of sizes (DN150 to DN375) manufactured by Vinidex.

d) A range of transition fitting suitable for joining different pipeline system are also available.

e) Stainless Steel 316 plain repair clamps and sewer OB junction clamps (clamps with oblique offtakes) manufactured by Cascade Control Pty Ltd.

All fabricated PVC fittings (DN 150 and DN 375) are manufactured in compliance with AS/NZS 1260 – *PVC-U pipes and fittings for drain waste and vent application.*

Vinidex also provides a range of “Rapid” Stainless Steel 316 repair clamps and sewer OB junction clamps to suit both StormPRO® and SewerPRO®. Refer to Appendix D. These repair clamps are generally designed to comply with the requirements of AS 4181-1999 – *Stainless steel clamps for waterworks purposes.* The Jointing clamps are used for a Spigot-Spigot pipe joint and the repair clamps can be used for sealing minor holes in the pipe wall or if the damage is major a section of pipe can be cut out and replaced using two jointing clamps.

Cascade Control also manufactures the Sewer OB Junction Clamp that has no Australian Standard.

3.2 Pipe Dimensions

A typical cross section of StormPRO® and SewerPRO® is shown in Figure 2.

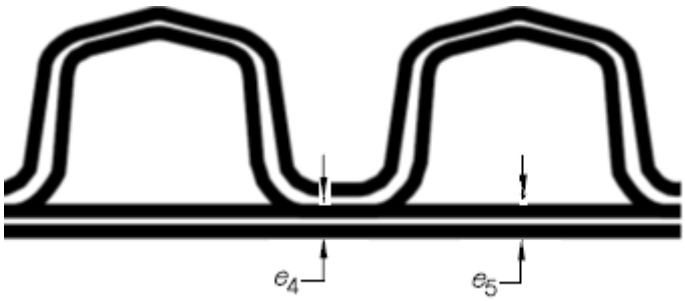


FIGURE 2: STORMPRO® AND SEWERPRO® TYPICAL CROSS SECTION

The minimum wall thickness of the inside layer, e4 and e5, for Type B pipe ID series complies with Table 4.6 in AS/NZS 5065:2005. Refer to Table 2.

The declared actual minimum inside diameters of the StormPRO® and SewerPRO® polypropylene (PP) pipes pipe are specified in Table 2.

TABLE 2: STORMPRO® AND SEWERPRO® TYPICAL PIPE DIMENSIONS TYPE B ID SERIES PIPES

Nominal Diameter (mm)	Mean Pipe Outside Diameter (mm)	Mean Pipe Internal Diameter (mm)	Profile Pitch (mm)	Minimum Profile Thickness (e_4) (mm)	Inner Wall Thickness (e_5) (mm)	Approximate Pipe Mass (kg/m)
150	169	148	17.5	2.5	1.2	1.4
225	259	226	26.2	3.0	1.6	3.1
300	343	300	34.9	3.2	2.0	5.1
375	428	374	44.9	4.5	2.4	7.9
450	514	448	52.8	5.6	3.1	11.7
525	600	523	66.0	6.4	3.5	15.2
600	682	596	75.4	7.4	3.9	19.6
750	835	731	88.0	10.5	5.0	30.5
900	999	873	105.6	11.9	5.7	41.8

The dimensions shown above are minimum values required to achieve the StormPRO® pipe stiffness classification of SN8. SewerPRO® has a higher pipe stiffness classification of SN10 which is achieved by adjusting the minimum profile thickness without affecting the mean internal and external diameter dimensions.

3.3 StormPRO® and SewerPRO® Pipe Effective Length

StormPRO® and SewerPRO® are available in spigot/socket configuration (Sp/So) in 6m and 3m nominal lengths respectively. The effective length of pipes is the overall length minus the insertion depth into the socket. The effective lengths of StormPRO® and SewerPRO® given below in Table 3:

TABLE 3: STORMPRO® AND SEWERPRO® PIPE EFFECTIVE LENGTH

Nominal Diameter (mm)	StormPRO® Length (Sp/So) Effective Length (m)	SewerPRO® Length (Sp/So) Effective Length (m)
150	6.02	2.95
225	5.99	2.92
300	5.94	2.87
375	5.93	2.86
450	5.95	2.86
525	5.89	2.80
600	5.85	2.76
750	5.92	2.82
900	5.91	2.81

NOTE: Nominal overall lengths are longer than Effective Length due to Socket length

3.4 New PRO2 joint for SewerPRO® and StormPRO® pipe

This report introduces a new joint design for the StormPRO® and SewerPRO® range of pipes and fittings.

The new joint design was undertaken as a result of feedback from installers, and a desire to make installation easier whilst maintaining the overall joint integrity.

The new joint design involves the following improvements:

- Parallel socket profile;
- Reduced socket to spigot clearance;
- Increased overall socket length;
- Stiffened geometry at lead in of socket;
- Simplified elastomeric seal profile.

The improved joint design results in easier installation and enhanced joint performance under adverse soil movement and deflection conditions. The PRO2 joint design uses a new redesigned elastomeric seal to match new socket geometry. PRO2 sockets should only be joined using PRO2 elastomeric seals. PRO2 sockets can be identified by a label on the socket and PRO2 elastomeric seals can be identified by PRO2 marking on the elastomeric seals.

The new PRO2 joint for SewerPRO® and StormPRO® pipe is not compatible with the original socket or elastomeric seals. It is important to use Vinidex fittings labelled PRO2 with Vinidex PRO2 pipes to ensure dimensional compatibility and system performance.

The original elastomeric seal (PRO) can be easily identified visually from the new elastomeric seal (PRO2) as shown in Figure 3 below. In addition, the PRO2 seals are clearly branded as ’PRO2’. Refer to Clause 8.

Original elastomeric seal profile

PRO2 elastomeric seal profile

FIGURE 3: DIFFERENCE BETWEEN ORIGINAL ELASTOMERIC SEAL (PRO) AND NEW ELASTOMERIC SEAL (PRO2)

To connect to existing SewerPRO® and StormPRO® sockets which have already been installed, the original ring is required, and limited stocks of the original rings are available from Vinidex. Refer to Appendix A - Option 1 for further instructions.

When connecting to existing SewerPRO® and StormPRO® it is preferable that the connection be made using the existing SewerPRO® and StormPRO® spigot inserted into the new PRO2 socket using PRO2 elastomeric seals. Refer to Appendix A - Option 2 for further instructions.

3.5 Elastomeric seals – Pipe and Fittings (excluding PE-PRO DN 750 and DN 900 Slip coupling)

Vinidex source their supply of PRO2 elastomeric seals from Hultec Vietnam (Hultec). Vinidex Product Code for Hultec Elastomeric seal is shown in Table 4.

Pipe lengths are joined by placing an EPDM elastomeric seal in the last trough of the corrugated spigot end of the pipe and inserting the spigot into the formed socket. Pipes can be cut to any length and joined in the same manner.

Figure 4 shows the joint in cross section for sizes DN150 to DN600. The pipe can be cut to length as required anywhere along the barrel and the same jointing system is used. Figure 4 also shows the position of elastomeric seal fitted between the last two corrugations of the spigot end.

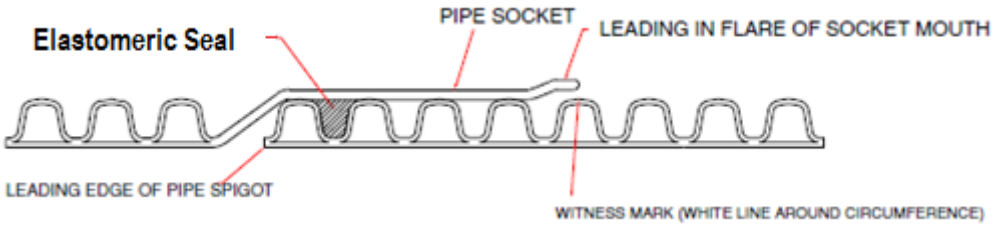


FIGURE 4: CROSS SECTION FOR DN 150 TO DN 600 ELASTOMERIC SEAL JOINT

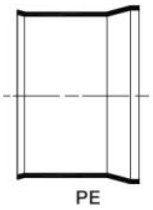
The spigot ends on pipe sizes DN 750 and DN 900 are geometrically different to the main pipe barrel. Where these pipe sizes need to be cut to length, slip couplings must be used for jointing. This system is suitable for occasional use but is not recommended for routine jointing. If many shorter pipe lengths are required, contact Vinidex to discuss an alternative solution. No chamfer is required. Refer to Clause 3.6.

All fittings are compatible with PRO and PRO2 polypropylene pipe provided the PRO2 elastomeric seal is used. All fittings have PRO2 sockets.

NOTE: PRO2 only refers to modified sockets and elastomeric seals; no change has been made to the pipe profile.

3.6 Elastomeric seals – PE-PRO DN 750 and DN 900 Slip coupling

The design of the PRO2 elastomeric seal supplied with the PE-PRO Slip Coupling has a larger cross-section that the standard PRO elastomeric seal used on joining DN 750 and DN 900 pipes.



PRO Slip Couplings

Vinidex Code	Size (mm)	Product Description		Availability
30450	150	150 PRO Slip Coupling SN8 PVC		✓
30451	225	225 PRO Slip Coupling SN8 PVC		✓
30452	300	300 PRO Slip Coupling SN8 PVC		✓
30453	375	375 PRO Slip Coupling SN8 PVC		✓
30454	450	450 PRO Slip Coupling	RMPE	Contact Vinidex
30455	525	525 PRO Slip Coupling	RMPE	Contact Vinidex
30456	600	600 PRO Slip Coupling	RMPE	Contact Vinidex
30457	750	750 PRO Slip Coupling	PE	Contact Vinidex
30458	900	900 PRO Slip Coupling	PE	Contact Vinidex

FIGURE 5: PE-PRO DN 750 and DN 900 Slip Coupling

TABLE 4: VINIDEX PRODUCT CODE FOR HULTEC ELASTOMERIC SEAL

Vinidex Product Code	Description
83449	150 PRO2 PP Ring EPDM
83401	225 PRO2 PP Ring EPDM
83444	300 PRO2 PP Ring EPDM
83445	375 PRO2 PP Ring EPDM
83446	450 PRO2 PP Ring EPDM
83447	525 PRO2 PP Ring EPDM
83448	600 PRO2 PP Ring EPDM
83426	750 PRO2 PP Ring EPDM
83421	900 PRO2 PP Ring EPDM
83416	750 PRO2 PP SlipCoup Ring EPDM
83417	900 PRO2 PP SlipCoup Ring EPDM

3.7 Supply of Elastomeric Seals

Elastomeric seals are normally supplied with all pipes and fittings. Additional elastomeric seals may be ordered separately if required.

Because the elastomeric seal is designed to fit on the outside of the spigot end of the pipe, it is not practical to supply the pipe with the elastomeric seal fitted due to the risk of damage and exposure during transport.

For this reason, each pipe is supplied with the elastomeric seal stored inside the socket end of the pipe. The seal is held in place during transport by adhesive tape.

When the pipe is to be installed, the elastomeric seal is removed from the socket and fitted to the spigot end of the pipe as described in the installation procedure.

3.8 Jointing to concrete structures

Vinidex recommends a jointing system for concrete structures such as manholes that incorporates a watertight seal (Hydrophilic seal). This system can be applied to connections to existing structures as well as new structures. The preferred seal is HYDROTITE DSS-0220 supplied by Corkjoint. Refer to Appendix F for Product Literature.

StormPRO® and SewerPRO® pipes may generally be connected to rigid structures without the use of short rocker pipes. These pipes have sufficient flexibility and strain tolerance to accommodate differential settlement at the interface. Figure 6 show typical arrangements for the connection of sewers of PP pipe materials to the MH base.

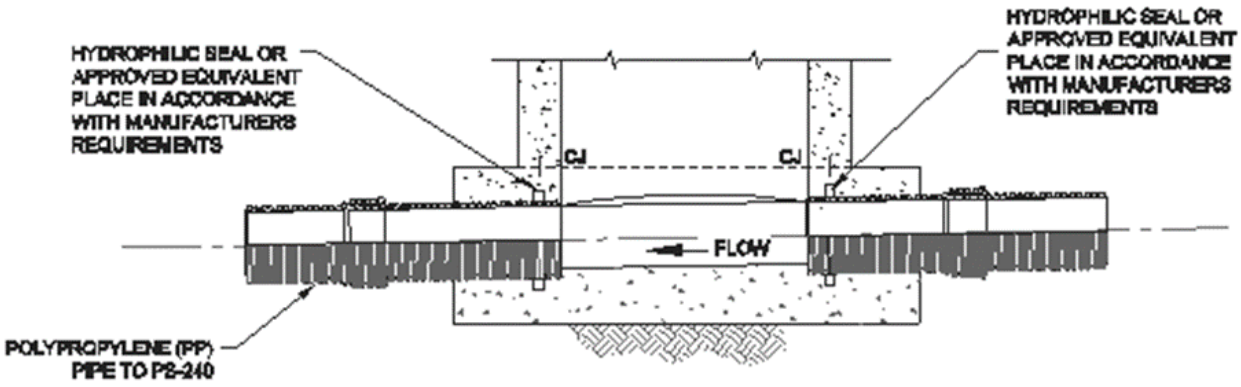


FIGURE 6: TYPICAL CAST IN-SITU CONCRETE MH BASE FOR PROFILE WALL PP SEWERS

Where short rocker pipes are specified, either in 300mm or 600mm lengths, these should be installed. The most cost-effective method is to cut pipe off-cuts to length on site, and join with plain couplings.

NOTE: Sanded shorts are not required as the corrugated pipe provides an adequate keying action into the concrete.

4 SCOPE OF THE APPRAISAL

This application for product appraisal applies to the complete StormPRO® (SN8 – black) and SewerPRO® (SN10 – dark grey) spigot-socket elastomeric jointed pipe and a limited range of injection moulded PP fittings. The scope of this appraisal includes:

a) StormPRO® pipes classified as SN8 with a minimum stiffness of 8,000 N/m/m and are available in 6m lengths in sizes from DN 150 to DN 900. StormPRO® pipes have a black external surface and a light grey internal surface. Refer to Table 5 for more detail.

b) SewerPRO® pipes, classified as SN10 with a minimum stiffness of 10,000 N/m/m and are available in 3m lengths in sizes from DN 150 to DN 900. SewerPRO® pipes are dark grey outside and light grey inside. Refer to Table 6 for more detail.

c) SewerPRO® DN 150 injection moulded PP fittings, classified as SN10 with a minimum stiffness of 10,000 N/m/m. The range includes DN 150 x 45° Junctions, DN 150 x 88° Junctions, DN 150 Sewer Tee, DN 150 x 45° and DN 150 x 90° bends, DN 150 push on cap, DN 150 sewer inspection tee assembly and DN 225 push on cap. Refer to Table 7 for more detail.

Refer to Appendix A for the full product range and product literature.

TABLE 5: STORMPRO® PIPE SCHEDULE

Product Code	Description	Stiffness Classification	Nominal Length
29479	StormPRO2 DN 150	SN 8	6 m
29456	StormPRO2 DN 225	SN 8	6 m
29458	StormPRO2 DN 300	SN 8	6 m
29460	StormPRO2 DN 375	SN 8	6 m
29471	StormPRO2 DN 450	SN 8	6 m
29473	StormPRO2 DN 525	SN 8	6 m
29475	StormPRO2 DN 600	SN 8	6 m
29418	StormPRO2 DN 750	SN 8	6 m
29419	StormPRO2 DN 900	SN 8	6 m

TABLE 6: SEWERPRO® PIPE SCHEDULE

Product Code	Description	Stiffness Classification	Nominal Length
29480	SewerPRO2 DN 150	SN 10	3 m
29457	SewerPRO2 DN 225	SN 10	3 m
29459	SewerPRO2 DN 300	SN 10	3 m
29461	SewerPRO2 DN 375	SN 10	3 m
29472	SewerPRO2 DN 450	SN 10	3 m
29474	SewerPRO2 DN 525	SN 10	3 m
29476	SewerPRO2 DN 600	SN 10	3 m
29427	SewerPRO2 DN 750	SN 10	3 m
29428	SewerPRO2 DN 900	SN 10	3 m

A limited range of injection moulded PP fittings for SewerPRO® PP pipes are supplied by Uniplas Moulding International Pty Ltd. Refer to Table 7.

TABLE 7: SEWERPRO® INJECTION MOULDED PP FITTINGS

Product Code	Description	Stiffness Classification
A1	SewerPRO® PP Sewer 45 deg. Junction DN 150	SN 10
A2	SewerPRO® PP Sewer 88 deg. Junction DN 150	SN 10
A3	SewerPRO® PP Sewer Tee DN 150	SN 10
A4	SewerPRO® PP Sewer 45 deg. Bend DN 150	SN 10
A5	SewerPRO® PP Sewer 90 deg. Bend DN 150	SN 10
A6	SewerPRO® PP Sewer push on cap DN 150	SN 10
A7	SewerPRO® PP Sewer Inspection Tee Assembly DN 225	SN 10
A8	SewerPRO® PP Sewer push on cap DN 150	SN 10

5 APPRAISAL CRITERIA

5.1 Quality Assurance Requirements

The WSAA Codes and Appraisal Reference Group accepts polypropylene pipes and fittings manufactured under cover of a third party certified management system complying with AS/NZS ISO 9001 and having ISO Type 5 product certification to 5065:2005, issued by a JAS-ANZ accredited certification body or by a certification body accredited by an international accreditation body recognised by JAS-ANZ.

5.2 Performance Requirements

StormPRO® and SewerPRO® polypropylene pipes and fittings have been appraised for compliance with the requirements of AS/NZS 5065:2005 *Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications*.

Appraisal criteria are also determined by the WSAA Product Appraisal Technical Reference Group and regularly reviewed to ensure that the criteria reflect the requirements of WSAA members.

The following Product Specification is also relevant to this application:

WSA PS 240 Polypropylene (PP), Ribbed Construction, Pipe and Fittings for Non-Pressure Applications – Sewerage.

A copy of the above Product Specification can be found in Appendix C or downloaded from the WSAA website.

6 COMPLIANCE WITH APPRAISAL CRITERIA

6.1 Compliance with Quality Assurance Requirements

Vinidex is a Quality Endorsed Company and holds AS/NZS ISO 9001:2008 Certificate of Registration No QEC0570 for the design, manufacture and distribution of polyethylene, polypropylene and unplasticised PVC pipes, conduits and associated fittings for the water supply, sewerage, drainage, electrical, mining, gas, rural and communications industries.

A copy of a Product Certification Certificate Licence No. SMKP20687 for AS/NZS 5065:2005 *Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications*, issued SAI Global, has also been provided.

Type Test results have been submitted to satisfactorily demonstrate compliance to AS/NZS 5065:2005 for the products listed in Table 5 and 6.

Vinidex are also nominated as the licence holder of the Standards Mark Licence Certificate No SMK21671 to AS/NZS 5065, issued by SAI Global, for the range of DN 150 injection moulded PP fittings, manufactured by Uniplas Moulding International Pty Ltd.

Type Test results have been submitted to satisfactorily demonstrate compliance to AS/NZS 5065:2005 for the products listed in Table 7.

Vinidex fabricated fittings to comply with AS/NZS 1260:2009 *PVC–U pipes and fittings for drain, waste and vent application*. The range of fabricated fittings is covered by the StandardsMark license, Certificate No. SMKA 1246, are identified in the StandardsMark Product Schedule.

Both SewerPRO® and StormPRO® Polypropylene pipes use Hultec elastomeric seals.

Thai Duong Joint Stock Company (Hultec – Vietnam) is a Quality Endorsed Company and holds AS/NZS ISO 9001:2008 Certificate of Registration Licence No 01 100 106571 issued by TUV Rheinland Cert GmbH. The scope of the Certificate is for the manufacture of Technical Rubber Products.

Hultec has product certification for their elastomeric seals used with StormPRO® and SewerPRO® pipes to AS 1646:2007 *Elastomeric seals for waterworks purposes* from

ApprovalMark Licence No. AMI-74510. Refer to Appendix B for copies of the Product Certification and Laboratory Report dated 2nd April 2015.

Refer to Appendix B for copies of the above Quality Management and Product Certification Certificates, including schedules.

6.2 Compliance with Performance Requirements

Table 8 lists the AS/NZS 5065:2005 type testing requirements for StormPRO® and SewerPRO® pipes and fittings. Test results relevant to the new joint design (identified with an asterisk) have been provided by Vinidex.

TABLE 8: AS/NZS 5065:2005 TYPE TESTING REQUIREMENTS

Clause No.	Requirement	Test Method
2.1.3	Mass of carbon black	ISO 6964
2.1.3	Particle size of carbon black	ASTM D3849
2.1.3	Toluene extract of carbon black	AS/NZS 4131 Appendix B
2.1.4	Volatile content	ISO 4437 Annex A
2.1.5	Melt mass-flow rate	ISO 1133 Condition 12
2.1.6	Thermal stability of PE	ISO/TR 10837
2.1.7	ESCR of PE	AS/NZS 1462.25
2.1.9	Internal pressure resistance of PP @ 95 Degree C x 9 samples	ISO 8773
2.1.10	Deconhesive resistance of PP	ISO 8773
2.2	Weathering resistance	AS/NZS 4131 Appendix C
2.3*	Elastomeric seals	AS 1646
3.2.2	Stiffness of pipes	AS/NZS 1462.22
3.2.3	Ring flexibility of pipes	AS/NZS 1462.23
3.4.1*	Hydrostatic pressure resistance of elastomeric seal joints	AS/NZS 1462.10
3.4.2*	Liquid infiltration of elastomeric seal joints	AS/NZS 1462.8
3.4.3*	Contact width and pressure of elastomeric seals	AS/NZS 1462.13
4.1.4.4*	Pipe spigot and socket ring stiffness	ISO 9969
4.1	Dimensions of pipes	AS/NZS 1462.1
4.2*	Effective length of pipes	AS/NZS 1462.1
4.3	Spigot ends of pipe	Visual Inspection
4.5*	Sockets formed on pipe ends	Clause 4.5
4.6	Freedom from defects	Clause 4.6
4.7	Marking	Visual Inspection

Refer to Appendix I for results of the type tests and batch release tests conducted in accordance with clauses as listed in Table A1 of AS/NZS 5065:2005.

The test results are presented in the below three tables:

- **Table I-1** - Results of the type tests conducted for obtaining original product certification to AS/NZS 5065 (i.e. WMKA21671) and renewal of licence WMKA/SMKP20687.
- **Table I-2** - Results of the batch release tests conducted for obtaining original product certification to AS/NZS 5065 (i.e. WMKA21671) and renewal of licence WMKA/SMKP20687.

- **Table I-3** - Results of the Re-type tests relevant to the new joint design of StormPRO® and SewerPRO® (named as PRO2) conducted in between 15 July to 1 October 2014. These type tests were conducted using Hultec elastomeric seals.

6.2.1 New Socket PRO2 joint design

Clause 3.4.1 of AS/NZS 5065:2005 sets out the hydrostatic test procedure for the assembled joint. This test involves applying a pressure of 80 kPa for 1 hour while a load is applied to the spigot to produce a deflection of 7.5%.

FIGURE 7: ADDITIONAL TESTING FOR NEW JOINT PRO2

To further test the joint beyond the requirements of the Standard, a deflection load was applied to produce a deflection of up to 50% as shown in Figure 7 above, before any leaks were detected. This extreme test highlights the benefits of the PRO2 joint which provides uniform stiffness across the joint.

7 FITTING INSTRUCTIONS, TRAINING AND INSTALLATION

The StormPRO® and SewerPRO® product manual provides detailed information on installation including:

- Handling and Storage
- Trench Preparation
- Minimum and maximum cover over pipe
- Jointing
- Cutting of Pipes
- Selection of Embedment Material
- Placing and Compacting Embedment Material
- Backfilling
- Connection to Structures
- Above-Ground Installation
- Stormwater Connections
- Field testing

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

Vinidex offers training to pipe installers based on the StormPRO® and SewerPRO® product manual. This training is conducted by Vinidex engineers and is available throughout Australia subject to demand. Site inspections and support is available on an ‘as required’ basis.

8 PRODUCT MARKING

Products are marked in accordance with Clause 4.7 of AS/NZS 5065:2005 Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications.

Pipes are marked with the following information by an ink jet printer at a maximum spacing of 1 m:

- Manufacturer's name;
- Nominal size;
- Stiffness class;
- Material type; and
- Date and location of manufacture.

Figure 8 shows the markings on a DN 375 SewerPRO® Pipe.

FIGURE 8: DN 375 SEWERPRO® PIPE MARKING

The markings include the following details.

29461 VINIDEX PHONE 13 11 69 SEWERPRO DN375 SN10 PP WATERMARK LICENCE NO. 20687 AS/NZS 5065 151216 EL01

Figure 9 shows the marking on the DN 300 PRO2 Hultec Elastomeric Seal marking.

The marking include the following details.

83444 DN300 PRO2 AS 1646 ✓ AMI

FIGURE 9: DN300 PRO2 HULTEC ELASTOMERIC SEAL MARKING

9 PACKAGING AND TRANSPORTATION

The StormPRO® and SewerPRO® product manual sets out the packaging specification. Pipes are packed in timber framed bundles held together with plastic strapping.

DN (mm)	Number of pipes per Crate
150	30
225	12
300	6
375	6
450	4
525	6
600	3
750	2
900	2

Refer to Appendix G for photos showing packaging and transportation.

10 PRODUCT WARRANTY

The Vinidex Terms and Conditions of Sale set out the limitation of liability for any defects in material or workmanship provided that such defect can be established by the principal to have existed prior to delivery.

All Vinidex pipes and fittings including SewerPRO® and StormPRO® are covered by Australian Competition and Consumer Act 2010.

Refer to Appendix H for a copy of Vinidex terms and conditions of sale.

11 WATER AGENCY EXPERIENCE WITH THE PRODUCT OR FIELD TESTING REPORT

A field test report was included in the original WSAA Product Appraisal Report PA 07/10 Issue 1 published in February 2008. Since then, there have been numerous successful StormPRO® and SewerPRO® product installations throughout Australia. If required, Vinidex can submit a field test report based on a recent installation.

12 DISCUSSION

The Vinidex Pty Ltd's SewerPRO® and StormPRO® pipe range comply with the appraisal quality requirements by providing evidence of their SAI Global quality systems certification for both AS/NZS 5065:2005 and ISO 9001:2008, a range of test reports were supplied supporting their StandardsMark licence.

The performance requirements of the elastomeric seal joints in AS/NZS 5065 Polyethylene and Polypropylene pipes and fittings for drainage and sewerage applications, have been enhanced to match with AS/NZS 1260 PVC-U pipes and fittings for drain, waste and vent applications. AS/NZS 5065 includes requirements for interface pressure and increased pressure differential for both infiltration and exfiltration tests. PIPA has previously published a specification, POP 011 Polyethylene and Polypropylene pipes and fittings for Drainage and Sewerage Applications which has been superseded by AS/NZS 5065.

SewerPRO® and StormPRO® pipes are intended primarily for buried applications. SewerPRO® has a dark grey coloured corrugated outside surface containing a portion of titanium dioxide and carbon black, both of which act as UV absorbers. In addition, the material contains a minimum quantity of 0.2% by mass of HALS light stabilizer. SewerPRO® is therefore able to withstand exposure to weathering during normal storage and transport. SewerPRO® pipes have a smooth light grey interior.

StormPRO® has a black coloured corrugated outside surface and a smooth light grey interior. StormPRO® contains carbon black in accordance with the requirements of AS/NZS 5065, hence able to withstand exposure to weathering during normal storage and transport. These two pipes do not have to be subjected to a weathering test.

NOTE: PIPA recommends long term storage (> 2 years) of polypropylene SewerPRO® pipe in direct sunlight should be avoided where possible. Pipes should be covered to provide shading with a light coloured screening, which allows airflow through the crates. Under no circumstances should black plastic be used.

Polypropylene was selected as the preferred material for SewerPRO® and StormPRO® because of its excellent impact and abrasion resistance, and other materials do not readily adhere to its surface.

StormPRO® and SewerPRO® are manufactured from high molecular weight, polypropylene block copolymer with high stiffness and impact strength.

Polypropylene is a member of the polyolefin family of plastics, and like other polyolefin materials, has excellent chemical resistance properties and is suitable for long term elevated temperature applications up to 60°C and short term applications up to 90°C.

Polyolefin materials such as polypropylene and polyethylene are known to have excellent abrasion resistance properties.

The graph (Source: Borealis) if Figure is based on abrasion testing using the Darmstadt method and clearly illustrates the abrasion resistance of polypropylene.

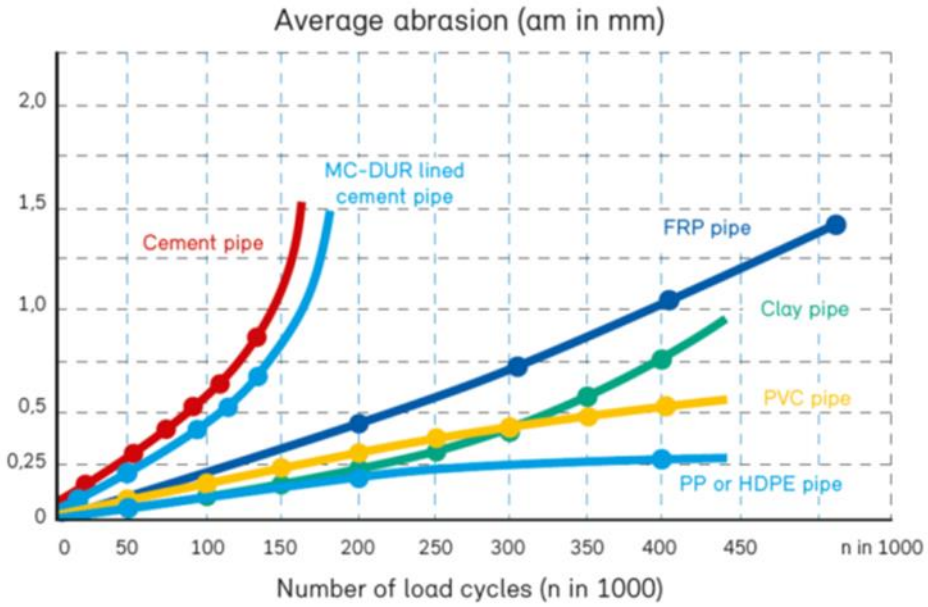


FIGURE 10: ABRASION RESISTANCE OF POLYPROPYLENE

Extensive abrasion testing has been conducted to confirm the superior abrasion resistance properties of polyethylene compared to other pipe materials. Polypropylene is considered to have similar abrasion properties to polyethylene. The polypropylene used in SewerPRO® and StormPRO® pipes is a special grade that has been optimised to provide appropriate processing characteristics and maximum stiffness.

Polypropylene is a member of the polyolefin family of plastics, which also includes Polyethylene and Polybutylene. These materials are comparatively inert, being resistant to a wide range of chemicals. Refer to the Vinidex Chemical Resistance Guide for thermoplastic pipe and fittings systems for resistance to specific chemicals by clicking the below link:

http://www.vinidex.com.au/wp-content/uploads/2013/03/VIN067-Chemical-Resistance-Guide.pdf

Polypropylene is considered to be immune to attack by microbiological organisms normally encountered in under-ground sewerage and drainage systems. Under the operating conditions experienced in sewer and drainage applications thermal degradation will not occur.

SewerPRO® (SN 10) sewer pipe and nominated fittings are regarded as 'fit for purpose' provided sewer pipeline design, installation, acceptance testing and commissioning are in accordance with the requirements of WSA 02 Sewerage Code of Australia.

StormPRO® (SN 8) drainage pipe and nominated fittings are regarded as 'fit for purpose' provided the drainage pipeline design, installation, acceptance testing and commissioning are in accordance with the manufacturers and agency requirements.

Polypropylene (PP-B) pipes have been used for over 30 years for sewerage and drainage applications, predominantly in Europe. Several years ago, structured wall, smooth bore, polypropylene sewerage and drainage pipes were also introduced in Australia. These are manufactured in accordance with AS/NZS 5065:2005.

The structural design of buried flexible pipe systems is addressed by AS/NZS 2566.1.

Table 2.1 of AS/NZS 2566.1:1998 lists material properties of commonly used pipeline systems, with the exception of polypropylene (PP) that was introduced into the Australia market around 2005. Since 2005, polypropylene (PP) drainage and sewer pipes have become common use pipe for many non-pressure applications.

In 2012, PIPA published an industry guideline titled 'POP015 *Design Guideline for Polypropylene Structured Wall Pipes*". POP015 tabulates the typical material characteristics of Vinidex SewerPRO® and StormPRO® PP-B, twin-wall, smooth bore, corrugated pipes for non-pressure applications.

A proposed amendment to AS/NZS 2566.1 is intended to clarify the applicability of AS/NZS 2566.1 to polypropylene sewer and drainage pipes.

Until Table 2.1 of AS/NZS 2566.1 is amended to include reference to the material properties of PP-B WSAA has included reference to POP015 in WSA 02:2014 Version 3.1 Gravity Sewerage Code of Australia.

13 OUTCOMES OF EXPERT PANEL PRODUCT REVIEW

The following questions and answers have been recorded in the WSAA report PA 07/10 Issue 1 published in February 2008.

Question 1: Please provide details requested of long term relaxation / expansion of the joint socket?

Answer 1: The StormPRO® and SewerPRO® elastomeric seal joint meets the requirements of AS/NZS 5065:2005 "*Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications*".

Type testing required by the Standard includes the following:

- Clause 3.4.1 Hydrostatic pressure resistance of elastomeric seal joints (Test method AS/NZS 1462.10)
- Clause 3.4.2 Liquid infiltration of elastomeric seal joints (Test method AS/NZS 1462.8)
- Clause 3.4.3 Contact width and pressure of elastomeric seal joints (Test method AS/NZS 1462.13)

The above tests must be conducted for any new material formulation or design, or once every five years, whichever occurs first.

The Standard also specifies the minimum effective sealing length for spigot mounted elastomeric seals to maintain the long-term integrity of the assembled joint.

Question 2: Please provide details on the resistance of the internal layer to jetting?

Answer 2: Polypropylene was selected as the preferred material for SewerPRO® and StormPRO® because of its excellent impact and abrasion resistance. Polypropylene is a member of the polyolefin family of plastics, which also includes polyethylene. Extensive abrasion testing has been conducted to confirm the superior abrasion resistance properties of polyethylene compared to other pipe materials. Polypropylene is considered to have similar abrasion properties to polyethylene.

SewerPRO® and StormPRO® incorporate the same grade of polypropylene material as used on the internal lining of Ultra Rib 2 rib-stiffened structured wall DWV pipe, manufactured by Uponor.

Ultra Rib 2 meets the requirements of WRc specification WIS 4-35-01 *Specification for thermoplastics structured wall pipe - supplementary test requirements*, which requires the pipe to withstand a jetting pressure of 18 MPa without damage to the inside wall.

Question 3: What is the termite resistance of polypropylene?

Answer 3: It is generally accepted that material hardness is an important factor in the resistance of plastics to termite attack. Polypropylene has a similar Shore D hardness to PE100 polyethylene, so it is reasonable to assume that polypropylene will have similar termite resistance to PE100 polyethylene.

Question 4: What is the products performance at high temperature?

Answer 4: Polypropylene pipes can withstand continuous service temperatures of up to 90°C and short term applications of up to 110°C without any adverse effects on performance. SBR and EPDM elastomeric seals can withstand continuous service temperatures of up to 90°C and short term applications of up to 120°C.

In contrast, PE100 polyethylene pipes can withstand continuous service temperatures of up to 70°C and short term applications of up to 80°C.

SewerPRO® and StormPRO® are currently supplied with EPDM elastomeric seals as standard.

Question 5: Please provide detail on the slip couplings available for the product range?

Answer 5: Slip couplings are rotational moulded in polyethylene to suit StormPRO® and SewerPRO® of size range from DN150 to DN900. These are designed to allow cut-ins to existing pipelines. The slip coupling is slid over the end of one of the pipe ends to be joined. Elastomeric seals are fitted to both pipe ends and the coupling is slid back into position over the joint.

Question 6: What is the availability of repair clamps in larger sizes and stainless steel repair fittings?

Answer 6: Standard stainless steel repair and junction clamps are available from several suppliers, manufactured to meet the requirements of AS 4181:1999 “Stainless Steel clamps for waterworks purposes”. Clamps are constructed from 316 Stainless Steel and incorporate a full-circle nitrile (NBR) gasket. Stainless steel clamps are available in sizes DN150 to DN600 to suit StormPRO® and SewerPRO®. Stainless steel clamps are suitable for use as repair clamps in these sizes for repairing minor or localised damage. These clamps must always be tensioned in accordance with the manufacturer’s instructions.

For DN750 and DN900 StormPRO® and SewerPRO®, damaged sections should be cut out and replaced with pipe and slip couplings.

Question 7: Why Rapid Clamps have Product Certification to AS 4181:1999 and not to AS 4181:2013?

Answer 7: If you refer page 13 (Appendix B Type Tests) of AS 4181:1999, Clause B5 (Preparation of Test samples) stipulates the hydrostatic test rig set up for the repair clamps, which is the most important part for Stainless Steel 316 repair clamps. The latest version AS 4181:2013 focussed on the SS316 clamps with flange offtakes and neglected the repair clamps and clamps with smaller BSP sockets (DN 50 and smaller). In fact 80-90% of installations are repair clamps and clamps with BSP thread offtakes, not clamps with flange offtakes. The latest version AS 4181:2013 have also removed the table 1 in page 7 and tables 2 and 3 in page 8, which states the minimum lengths for different types of clamps such as (a) plain; (b) bossed or thread offtake; and (c) flanged offtake.

As the original Standard AS 4181:1999 includes all the above clauses, Rapid Clamps prefer maintaining Product Certification to the original standard AS 4181:1999, and not the 2013 version.

Question 8: What is the availability of stainless steel sewer oblique branches for post installation of HCB's?

Answer 8: Stainless steel sewer OB junction clamps are available in sizes DN150 to DN450 to suit SewerPRO® and StormPRO®. Standard PVC off takes sizes are DN100, DN150 and DN225 in 45º and 90º angles. As with repair clamps, these clamps must always be tensioned in accordance with the manufacturer's instructions.

As it is not common practice to connect HCB's to mains larger than DN450, it is recommended that fabricated polypropylene junctions be cut into the mains using slip couplings for DN525 and larger. These junctions are available from Vinidex on request.

Question 9: What is the products load resistance/performance when pushed into a bore?

Answer 9: SewerPRO® and StormPRO® have been successfully installed in pipe jacking applications in Australia. Guidance from Vinidex is recommended when designing and planning these installations. SewerPRO® and StormPRO® are not designed for boring applications.

Question 10: Is there field difficulty in being able to get granular embedment between profiles at the bottom of the pipe?

Answer 10: The spacing between corrugations on SewerPRO® and StormPRO® varies between 5.1mm for DN150 and 28.5mm for DN900. When compacted in accordance with the relevant standards, suitably sized granular embedment material works into the spacing between corrugations to provide support to the pipe.

Minimum particle sizes for embedment material are listed in Table 5.4 of AS/NZS 2566.2:2002 "Buried flexible pipelines. Part 2: Installation".

Question 11: Please provide some more information on jointing to concrete structures: i.e. elaborate on "watertight" seals, type of seal, etc.

Answer 11: Refer to page 11 in the below hyperlink to see a typical entry or exit of SewerPRO® and StormPRO® pipes to a concrete structure.

http://www.vinidex.com.au/wp-content/uploads/2013/03/VIN007-StormPRO-and-SewerPRO-Installation-Guide.pdf

StormPRO® and SewerPRO® pipes may generally be connected to rigid structures without the use of short rocker pipes. StormPRO® and SewerPRO® pipes have sufficient flexibility and strain tolerance to accommodate differential settlement at the interface.

The connection is made waterproof through the application of a hydrophilic seal such as Hydrotite. The seal is attached to the pipe using adhesive tape and expands on contact with wet concrete. This provides a satisfactory long-term waterproof seal between the pipe and concrete structure.

14 LIFE EXPECTANCY

Plastics pipe systems are often designed on the basis of 50 year extrapolated test data. This is established international practice but is not intended to imply the service life of drainage pipe is limited to 50 years. For correctly manufactured and installed systems, the actual life cannot be predicted, but can logically be expected to be well in excess of 100 years before major rehabilitation is required.

15 FUTURE WORKS

There are no future work items.

16 DISCLAIMER

This Product Appraisal Report (Report) is issued by the Water Services Association of Australia Limited on the understanding that:

This Report applies to the product(s) as submitted. Any changes to the product(s) either minor or major shall void this Report.

To maintain the recommendations of this Report any such changes shall be detailed and notified to the Product Appraisal Manager for consideration and review of the Report and appropriate action. Appraisals and their recommendations will be the subject of continuous review dependent upon the satisfactory performance of products.

WSAA reserves the right to undertake random audits of product manufacture and installation. Where products fail to maintain appraised performance requirements the appraisal and its recommendations may be modified and reissued. Appraisal reports will be reviewed and reissued at regular intervals not exceeding five (5) years.

The following information explains a number of very important limits on your ability to rely on the information in this Report. Please read it carefully and take it into account when considering the contents of this Report.

Any enquiries regarding this report should be directed to the Program Manager Asset Creation, Carl Radford, Phone: 03 8605 7601 email carl.radford@wsaa.asn.au.

16.1 Issue of Report

This Report has been published and/or prepared by the Water Services Association of Australia Limited and nominated Project Manager and peer group of technical specialists (the Publishers).

The Report has been prepared for use within Australia only by technical specialists that have expertise in the function of products such as those appraised in the Report (the Recipients).

By accepting this Report, the Recipient acknowledges and represents to the Publisher(s) and each person involved in the preparation of the Report that the Recipient has understood and accepted the terms of this Disclaimer.

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Recipients should also independently verify and assess the appropriateness of any recommendation in the Report, especially given that any recommendation will not take into account a Recipient's particular needs or circumstances.

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APPENDIX A - TECHNICAL MANUAL / BROCHURES

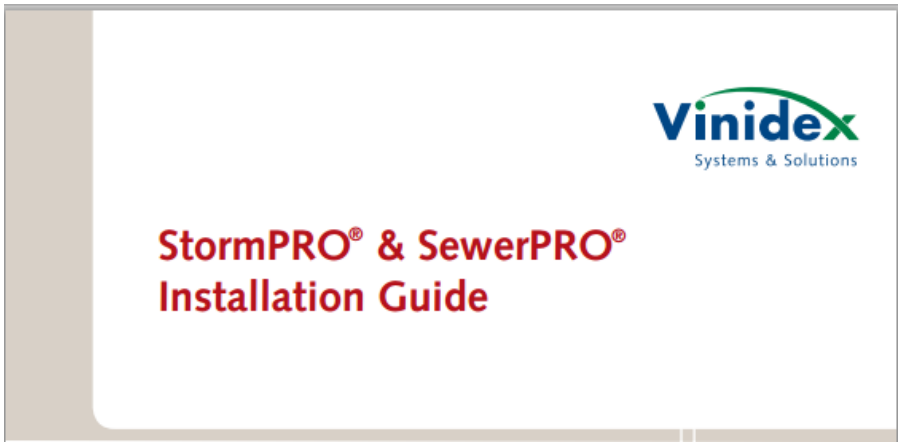
The following documents could be accessed from Vinidex website.

a) StormPRO® and SewerPRO® product catalogue

http://www.vinidex.com.au/wp-content/uploads/20150415-VIN264-StormPRO-and-SewerPRO-Product-CatalogueLR.pdf

b) StormPRO® and SewerPRO® Installation Guide

http://www.vinidex.com.au/wp-content/uploads/2013/03/VIN007-StormPRO-and-SewerPRO-Installation-Guide.pdf



c) StormPRO® and SewerPRO® Product Range

http://www.vinidex.com.au/wp-content/uploads/VIN264-StormPRO-and-SewerPRO-PP-Catalogue-Nov-2013.pdf

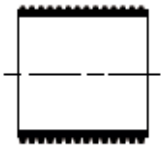
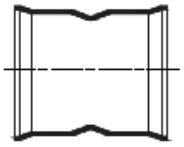
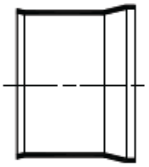
The complete range of standard PP, PE and PVC fittings can be accessed from the below Vinidex catalogue link. http://www.vinidex.com.au/wp-content/uploads/VIN304-StormPRO-and-SewerPRO-Product-Range.pdf

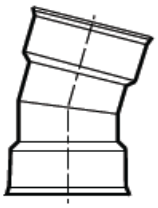
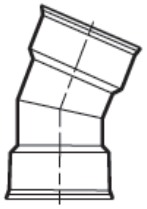
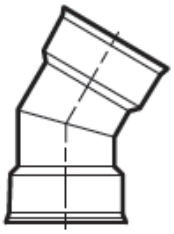
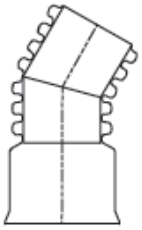
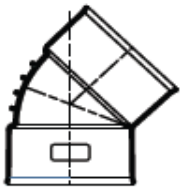
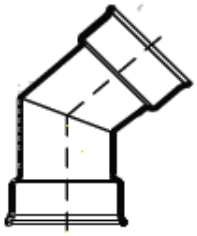
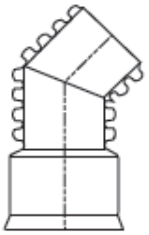
The catalogue also provides an indication of availability of each fitting and the end configuration. The description of each fitting in the list is followed by a code – PVC, RMPE or PP which denotes the manufacturing method as detailed in Table 6.3.

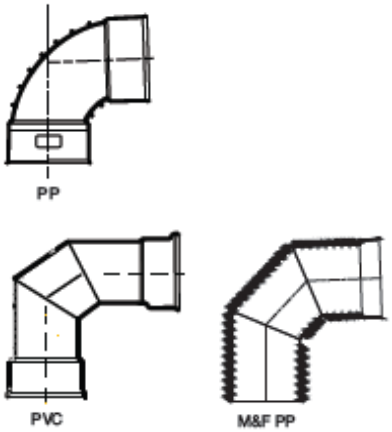
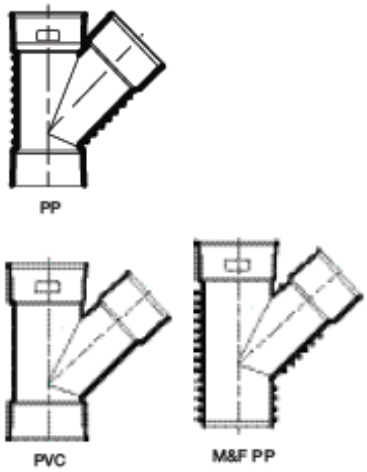
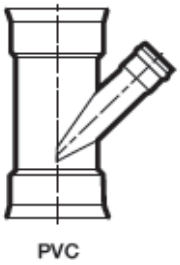
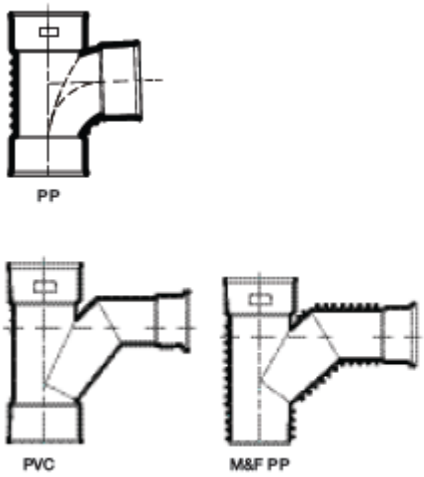
Table A0: Details of PP, PE and PVC – PRO fittings

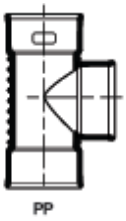
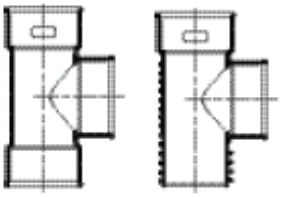
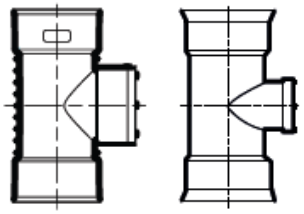
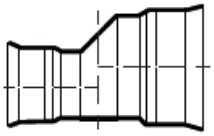
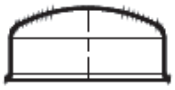
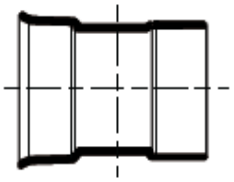
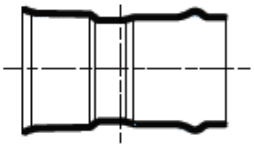
Code	Size	Description	Manufacturer	Location	Manufacturing Standard	Product Certification
PVC	DN150 – DN375	Fabricated PVC fittings (from PVC pipe)	Vinidex	Smithfield, NSW 2164	AS/NZS 1260	Submitted, all fittings are listed.
RMPE	≥ DN450	Rotational moulded PE fittings	Rotadyne	St Marys, NSW 2760	AS/NZS 5065	Not submitted
PP	DN150 only	Injection moulded PP fittings	Uniplas Moulding	Wetherill Park, NSW 2164	AS/NZS 5065	Submitted
	≥ DN450	Fabricated PP fittings (from SewerPRO® PP pipe)	Rodney Industries	Chermside, QLD 4032	AS/NZS 5065	Not submitted

TABLE A1: STORMPRO® AND SEWERPRO® PRODUCT RANGEPP, PE AND PVC-U (DWV) FITTINGS

Description	Size	Figure
PRO Shorts for MH (Short rocker pipes)	DN 150 to 900, SN10, 600mm PP	 PP
PRO Couplings	DN 150 to 375, SN8, PVC DN 450 to 600, RMPE	 PVC and PE
PRO Slip Couplings	DN 150 to 375, SN8, PVC DN 450 to 600, RMPE DN 750 – 900, PE	 PE

Description	Size	Figure
15 Degree PRO Bends	DN 150 to 375 15D, SN8, FF PVC	 PVC
22.5 Degree PRO Bends	DN 150 to 375 22.5D, SN8, FF PVC	 PVC
30 Degree PRO Bends	DN 150 to 375 30D, SN8, FF PVC DN 450 to 600 30D SN10, MF PP	 PVC  M&F PP
45 Degree PRO Bends	DN 150 45D, SN10, FF PP DN 225 to 375 45D FF PVC DN 450 to 900 30D SN10, MF PP	 F&F PP  PVC  M&F PP

Description	Size	Figure
88 Degree PRO Bends	DN 150 88D, SN10 FF PP DN 225 to 375 88D FF PVC DN 450 to 900 88D SN10, MF PP	
45 Degree PRO Junctions	150 45D SN10 FF PP DN 225 to 375 45D SN8, FF PVC (with junctions 150 to 300) DN 450 to 900 45D SN10, MF PP	
45 Degree PRO Junction Adaptor to PVC DWV	225 100 PROJun 45D, SN8, FF PVC SWJ 225 100 PROJun 45D, SN8, FF PVC RRJ	
88 Degree PRO Junctions	150 88D SN10, FF PP DN 225 to 375 88D SN8, FF PVC (with junctions 150 to 300) DN 450 to 900 88D SN10, MF PP	

Description	Size	Figure
PRO Tees	150 SN10 FF PP DN 225 to 375 SN8, FF PVC (with branches 150 to 300) DN 450 to 900 SN10, MF PP (with branches 150 to 375)	 PP  PVC M&F PP
PRO Inspection Tees	150 SN10 FF PP DN 225 to 375 SN8, FF PVC (with 150 branch)	 PP PVC
PRO Level Invert Tapers	DN 225 to 375 SN8, FF PVC (with outlets 150 to 300)	 PVC
PRO Push On Caps	DN 150 to 225 PP DN 300 to 375 PVC DN 450 to 600 RMPE	 PP and PE  PVC
PRO Adaptor Couplings – PRO to PVC DWV SWJ	DN 150 to 375 SN8, PVC SWJ	 PVC
PRO Adaptor Couplings – PRO to PVC DWV RRJ	DN 150 to 375 SN8, PVC RRJ	 PVC

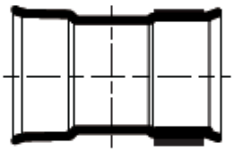
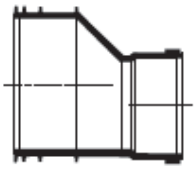
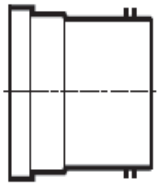
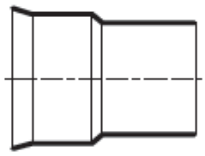
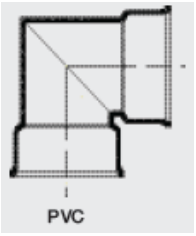
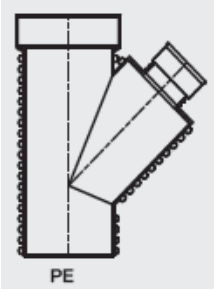
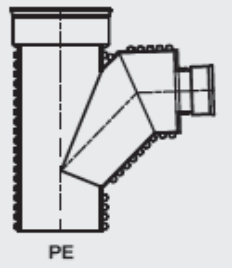
Description	Size	Figure
PRO Adaptor Couplings – PRO to Ultra Rib	DN 150 to 375 SN8, PVC URib	
PRO Adaptor Couplings – PRO Spigot to PVC DWV SWJ Socket	150 x 100 PRO LIT M-DWV F no cap	
PRO Adaptor Couplings – PRO Spigot to PVC DWV SWJ Socket	150 PRO Access Coup DWV F +cap	
PRO Adaptor Couplings – PRO to PVC DWV Spigot	DN 150 to 375	

TABLE A2: STORMPRO® APPLICATION ONLY PVC-U (DWV) FITTINGS

Description	Size	Figure
Stormwater 90 Degree PRO Elbows	DN 225 to 375 90D SN8, FF PVC	
45 Degree Stormwater Junctions	DN 225 to 375 45D SN8, FF PVC	

Description	Size	Figure
88 Degree Stormwater Junctions	DN 225 to 375 88D SN8, FF PVC	

APPENDIX A - OPTION 1: CONNECTION TO EXISTING SEWERPRO® AND STORMPRO® SOCKET

Step 1 – Expose existing SewerPRO® or StormPRO® socket.	
Step 2 – Fit original elastomeric seal to spigot end of pipe to be inserted into existing socket.	
Step 3 - Apply a generous quantity of Vinidex jointing lubricant to the inside of the existing socket. Avoid getting lubricant under the elastomeric seal.	
Step 4 - Insert the leading edge of the spigot into the socket. It is essential that pipes are in a straight line before attempting to make the joint.	
Step 5 - Do not apply jointing force directly to the socket. Insert a short piece of pipe in the socket. The short piece can be an off-cut, 50mm longer than the socket, and can be re-used	
Step 6 – Apply an even jointing force. Subject to pipe diameter and local conditions, use a crowbar to push on a timber lock on the end of the short pipe.	
Step 7 – Push home the pipe until the spigot end comes into contact with the inner wall of the socket.	

APPENDIX A - OPTION 2: CONNECTION TO EXISTING SEWERPRO® AND STORMPRO® SPIGOT (PREFERRED)

Step 1 – Expose existing SewerPRO® or StormPRO® socket.	
Step 2 – Fit PRO2 elastomeric seal to existing spigot end of pipe to be inserted into new PRO2 socket.	
Step 3 - Apply a generous quantity of Vinidex jointing lubricant to the inside of the existing socket. Avoid getting lubricant under the elastomeric seal.	

Step 4 - Insert the leading edge of the spigot into the PRO2 socket. It is essential that pipes are in a straight line before attempting to make the joint.	
Step 5 - Do not apply jointing force directly to the socket. Insert a short piece of pipe in the socket. The short piece can be an off-cut, 50mm longer than the socket, and can be re-used	
Step 6 – Apply an even jointing force. Subject to pipe diameter and local conditions, use a crowbar to push on a timber lock on the end of the short pipe.	
Step 7 – Push home the pipe until the spigot end comes into contact with the inner wall of the socket.	

For further details refer the StormPRO® and SewerPRO® Installation Guide in Appendix A.

APPENDIX B - QUALITY AND PRODUCT CERTIFICATIONS

SEWERPRO® AND STORMPRO® PP PIPES AND HULTEC EPDM ELASTOMERIC SEAL

TABLE B1: VINIDEX PTY LTD – MANAGEMENT SYSTEMS

Business Location: 101 Byrnes Road, Wagga Wagga, NSW 2650 and 12 other sites	
Quality Systems Standard	ISO 9001:2008
Certification licence no.	QEC0570
Certifying agency	SAI Global
First date of certification	19 February 1991
Current date of certification	8 May 2013
Expiry date of certification	13 May 2016

TABLE B2: VINIDEX PTY LTD – PRODUCT CERTIFICATION

Business Location: 101 Byrnes Road, Wagga Wagga, NSW 2650	
Product Standard/Spec.	AS/NZS 5065:2005
Certificate No.	SMKP20687
Issuing certification body	SAI Global
First date of certification	10 August 2011
Current date of certification	22 January 2014
Expiry date of certification	9 August 2016

TABLE B3: TERRAMIX S.A / HULTEC – MANAGEMENT SYSTEMS

Main Site: De Empaques Santa Ana, 100 Mts Este, 150 Mts Sur, Pozos Santa Ana, San José, Costa Rica	
Quality Systems Standard	ISO 9001:2008
Certificate No.	94-301h
Certifying agency	Intertek Testing Services NA, Inc. 70 Codman Hill Road - Boxborough, MA , USA
First date of certification	14 December 1994
Current date of certification	14 December 2015
Expiry date of certification	14 September 2018

TABLE B4: HULTEC VIETNAM (THAI DUONG JOINT STOCK COMPANY) – MANAGEMENT SYSTEMS

Business Address: Lot A-6B-CN My Phuoc 3 Industrial Park, Ben Cat District, Binh Duong Province, Vietnam	
Quality Systems Standard	ISO 9001:2008
Certificate No.	01 100 106571
Certifying agency	TUV Rheinland Cert GmbH
First date of certification	2010
Current date of certification	30 June 2014
Expiry date of certification	17 May 2016

TABLE B5: THAI DUONG JOINT STOCK COMPANY – PRODUCT CERTIFICATION

Business Address: Lot A-6B-CN My Phuoc 3 Industrial Park, Ben Cat District, Binh Duong Province, Vietnam	
Product Standard/Spec.	AS 1646:2007 – *Elastomeric seals for waterworks purposes*
Certificate No.	AMI 74510
Certifying agency	Approval Mark
Current date of certification	10 February 2013
Expiry date of certification	10 February 2018

FITTINGS FOR SEWERPRO® AND STORMPRO® PP PIPES

TABLE B6: CASCADE CONTROL PTY LTD – MANAGEMENT SYSTEMS

Business Location: 183 Elsburg Road, Delville Ext 4, Germiston, Gauteng 1401, South Africa	
Quality Systems Standard	ISO 9001:2008
Certification licence no.	ZA13/208253
Certifying agency	SGS South Africa Systems & Services Certification
First date of certification	July 2013
Current date of certification	22 July 2013
Expiry date of certification	22 July 2016

TABLE B7: RODNEY INDUSTRIES – MANAGEMENT SYSTEMS

Business Location: 19 Valente Close, Chermside QLD 4032	
Quality Systems Standard	ISO 9001:2008
Certification licence no.	QEC28136
Certifying agency	SAI Global
First date of certification	5 October 2011
Current date of certification	30 August 2014
Expiry date of certification	4 October 2017

TABLE B8: ROTADYNE PTY LTD – QUALITY ASSURNACE MANUAL 2014

It is a 15 pages report detailing the quality assurance and control followed by the Company. This manual prepared on 13/11/2014 has been submitted in lieu of ISO 9001 Quality Management Certification.

TABLE B9: UNIPLAS MOULDING INTERNATIONAL PTY LTD – MANAGEMENT SYSTEMS

Business Location: Unit 2A/5 Wenban Place, Wetherill Park NSW 2164	
Quality Systems Standard	AS/NZS ISO 9001:2008
Certification licence no.	AUS13000063
Certifying agency	Bureau Veritas Certification
First date of certification	9 July 1998
Current date of certification	15 March 2013
Expiry date of certification	15 March 2016

TABLE B10: VINIDEX PTY LTD – PRODUCT CERTIFICATION

Business Location: Unit 3/5 Wenban Place, Wetherill Park NSW 2164	
Product Standard/Spec.	AS/NZS 5065:2005
Certification licence no.	SMKP21671
Issuing certification body	SAI Global
First date of certification	10 August 2011
Current date of certification	10 August 2011
Expiry date of certification	9 August 2016

TABLE B11: CASCADE CONTROL PTY LTD T/RAPID CLAMPS – PRODUCT CERTIFICATION

Business Location: Cascade House, 183 Elsburg Road, Deville Ext 4, Germiston, Gauteng 1401, South Africa	
Product Standard/Spec.	AS 4181:1999
Certificate No.	SMK02626
Issuing certification body	SAI Global
First date of certification	2 October 2002
Current date of certification	4 May 2012
Expiry date of certification	1 October 2017

TABLE B12: VINIDEX PTY LTD – PRODUCT CERTIFICATION

Business Location: Extrusion – 254 Woodpark Road, Smithfield NSW 2164	
Product Standard/Spec.	AS/NZS 1260:2009
Certificate No.	SMK1246
Issuing certification body	SAI Global
First date of certification	28 July 1993
Current date of certification	21 March 2012
Expiry date of certification	26 July 2016

CERTIFICATE OF REGISTRATION

This is to certify that:

Vinidex Pty Ltd

ABN 42 000 664 942

(Refer to Attachment to Certificate of Registration dated 7 June 2013 for additional certified sites)

operates a

QUALITY MANAGEMENT SYSTEM

which complies with the requirements of

ISO 9001:2008

for the following scope

The design, manufacture and distribution of polyethylene, polypropylene and unplasticised PVC pipes, conduits and associated fittings for the water supply, sewerage, drainage, electrical, mining, gas, rural and communications industries.

Certificate No: QEC0570

Issued: 7 June 2013
Expires: 13 May 2016

Originally Certified: 19 February 1991
Current Certification: 8 May 2013

Samer Chaouk
Head of Policy, Risk and Certification

Paul Butcher
Global Head – Assurance Services

Certified System ISO 9001

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ATTACHMENT TO

CERTIFICATE OF REGISTRATION

These sites are registered under Certificate No: QEC0570 issued on 7 June 2013.

Vinidex Pty Ltd

ABN 42 000 664 942

Extrusion 254 Woodpark Road Smithfield NSW 2164 AUSTRALIA

Injection Moulding 254 Woodpark Road Smithfield NSW 2164 AUSTRALIA

101 Byrnes Road Wagga Wagga NSW 2650 AUSTRALIA

3846 Marjorie Street Berrimah NT 0828 AUSTRALIA

49 Enterprise Street Bohle QLD 4818 AUSTRALIA

14 Enterprise Street Bohle QLD 4818 AUSTRALIA

Lot 2, Witmack Road Charlton QLD 4350 AUSTRALIA

224 Musgrave Road Coopers Plains QLD 4108 AUSTRALIA

9 - 11 Kaurna Avenue Edinburgh SA 5111 AUSTRALIA

15 Thistle Street South Launceston TAS 7249 AUSTRALIA

Unit 1 10 Duerdin Street Notting Hill VIC 3168 AUSTRALIA

231 - 245 St Albans Road Sunshine VIC 3020 AUSTRALIA

Sainsbury Road O'Connor WA 6163 AUSTRALIA

These registrations are dependent on Vinidex Pty Ltd maintaining their scope of registration to ISO 9001:2008.

CERTIFICATE OF CONFORMITY

SAI Global hereby grants:

Vinidex Pty Ltd

ABN 42 000 664 942

3/5 Wenban Place, Wetherill Park, NSW 2164, Australia

Watermark Certificate of Conformity - Level 1

Evaluated to:

AS/NZS 5065:2005 - Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

"the WaterMark Licensee" the right to use or arrange the use of the WATERMARK as shown below only in respect of the goods described and detailed on the product schedule identified on www.saiglobal.com which are produced by the WaterMark Licensee or on behalf of the WaterMark Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the WATERMARK and the Terms and Conditions for certification. The WaterMark Licensee covenants to comply with all the Rules and Terms and Conditions

Certificate No:WMKA21671

Issued: 13 May 2014
Expires: 12 February 2019

Originally Certified: 13 February 2009
Current Certification: 13 May 2014

Samer Chaouk
Head of Policy, Risk and Certification

WaterMark™

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WWW.JAS-ANZ.ORG/REGISTER

*** For details of manufacture, refer to the licensee**

The WATERMARK is a registered certification trademark of Standards Australia Limited(ACN 087 326 690) and is issued under licence by SAI Global Certification Services Pty Limited (ACN 108 716 669) ("SAI Global") 680 George Street, Sydney NSW 2000, GPO Box 5420 Sydney NSW 2001. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. Refer to www.saiglobal.com for the list of product models.

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SCHEDULE TO
CERTIFICATE OF CONFORMITY

SAI Global hereby grants:

Vinidex Pty Ltd

3/5 Wenban Place, Wetherill Park, NSW 2164, Australia

Watermark Certificate of Conformity - Level 1

Evaluated to:

AS/NZS 5065:2005 - Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

Model identification of the goods on which the WATERMARK may be used:

Model Identification	Model Name	Brand Name	Product Description	Date Endorsed
A1	PP-SewerPro	Vinidex	PP Sewer 45 deg. junction	10 Feb 2009
A2	PP-SewerPro	Vinidex	PP Sewer 88 deg. Junction	10 Feb 2009
A3	PP-SewerPro	Vinidex	PP Sewer Tee	10 Feb 2009
A4	PP-SewerPro	Vinidex	PP Sewer 45 deg. Bend	10 Feb 2009
A5	PP-SewerPro	Vinidex	PP Sewer 90 deg. Bend	10 Feb 2009
A6	PP-SewerPro	Vinidex	PP Sewer push on cap	10 Feb 2009
A7	PP-SewerPro	Vinidex	PP Sewer Inspection Tee Assembly	12 May 2014
A8	PP-SewerPro	Vinidex	PP Sewer push on cap	13 Feb 2009

End of Record

Certificate No: WMKA21671 Issued Date: 13 May 2014

This schedule supersedes all previously issued schedules

*** For details of manufacture, refer to the licensee**

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STANDARDSMARK LICENCE

SAI Global hereby grants:

Vinidex Pty Ltd

ABN 42000664942

3/5 Wenban Place, WETHERILL PARK, NSW 2164, Australia

StandardsMark Licence

Manufactured to:

***AS/NZS 5065:2005* - Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications**

"the StandardsMark Licensee" the right to use the STANDARDSMARK as shown below only in respect of the goods described and detailed in the Schedule which are produced by the Licensee or on behalf of the Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the STANDARDSMARK and the Terms and Conditions for certification and licence. The Licensee covenants to comply with all the Rules and Terms and Conditions.

Certificate No:SMKP21671

Issued: 10 August 2011
Expires: 9 August 2016

Originally Certified: 10 August 2011
Current Certification: 10 August 2011

Duncan Lilley
Global Head – Assurance Services

Alex Ezrakhovich
General Manager – Certification Services

Certified Product™ Australian Standard

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*** For details of manufacture, refer to the licensee**

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Licence Holder : Vinidex Pty Ltd
ABN : 42000664942
Licence No : SMKP21671

Certified Product™
View PDF Certificate

Standard Number : AS/NZS 5065:2005 **Standard Title :** Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
Originally Certified : 10 Aug 2011 **Issued Date :** 10 Aug 2011
Currently Certified : 10 Aug 2011 **Expires :** 9 Aug 2016

Site Details :

	State	Country
•	NSW	Australia

Product Details :

Standard - AS/NZS 5065:2005 Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

Model Identification	Model Name	Brand Name	Product Description	Product Type	Nominal Size (DN)	SDR	Stiffness Classification (SN)	Joint Type	Colour	Material Designation	Date Endorsed
A1	PP-SewerPro	Vinidex	PP Sewer 45 deg junction	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A2	PP-SewerPro	Vinidex	PP Sewer 88 deg. Junction	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A3	PP-SewerPro	Vinidex	PP Sewer Tee	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A4	PP-SewerPro	Vinidex	PP Sewer 45 deg Bend	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A5	PP-SewerPro	Vinidex	PP Sewer 90 deg. Bend	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A6	PP-SewerPro	Vinidex	PP Sewer push on cap	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A7	PP-SewerPro	Vinidex	PP Sewer Inspection Tee Assembly	PP Fittings ID Series	150	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011
A8	PP-SewerPro	Vinidex	PP Sewer push on cap	PP Fittings ID Series	225	N/A	SN 10	Rubber ring joint	Dark grey	PP	9 Aug 2011

STANDARDSMARK LICENCE

SAI Global hereby grants:

Vinidex Pty Ltd

ABN 42 000 664 942

101 Byrnes Road, Wagga Wagga, NSW 2650, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 5065:2005 - Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

"the StandardsMark Licensee" the right to use the STANDARDSMARK as shown below only in respect of the goods described and detailed in the Schedule which are produced by the Licensee or on behalf of the Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the STANDARDSMARK and the Terms and Conditions for certification and licence. The Licensee covenants to comply with all the Rules and Terms and Conditions.

Certificate No:SMKP20687

Issued: 22 January 2014
Expires: 9 August 2016

Originally Certified: 10 August 2011
Current Certification: 22 January 2014

Paul Butcher
Global Head – Assurance Services

Samer Chaouk
Head of Policy, Risk and Certification

Certified Product™ Australian Standard

JAS-ANZ
WWW.JAS-ANZ.ORG/REGISTER

*** For details of manufacture, refer to the licensee**

The STANDARDSMARK is a registered certification trademark of SAI Global Limited (A.C.N. 050 644 642) and is issued under licence by SAI Global Certification Services Pty Limited (ACN 108 716 669) ("SAI Global") 680 George Street, Sydney NSW 2000, GPO Box 5420 Sydney NSW 2001. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. Refer to www.saiglobal.com, for the list of product models.

SAI GLOBAL
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SCHEDULE TO
STANDARDSMARK LICENCE

SAI Global hereby grants:

Vinidex Pty Ltd

101 Byrnes Road, Wagga Wagga, NSW 2650, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 5065:2005 - Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

Model identification of the goods on which the STANDARDSMARK may be used:

Model Identification	Model Name	Brand Name	Product Description	Date Endorsed
A1	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
A2	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
A3	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
A4	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
A5	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
A6	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
A7	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
A8	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
A9	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
B1	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
B2	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
B3	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
B4	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
B5	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
B6	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
B7	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
B8	PP - StormPRO	Vinidex	PP Stormwater pipe	9 Aug 2011
B9	PP - SewerPRO	Vinidex	PP Sewer pipe	9 Aug 2011
C1	PP - SewerPRO	Vinidex	PP Sewer Coupling	22 Jan 2014

End of Record

Certificate No: SMKP20687 Issued Date: 22 January 2014

This schedule supersedes all previously issued schedules

*** For details of manufacture, refer to the licensee**

SAI GLOBAL
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Certificate

Standard **ISO 9001:2008**

Certificate Registr. No. 01 100 106571

TÜV Rheinland Cert GmbH certifies:

Certificate Holder: **THAI DUONG JOINT STOCK COMPANY (HULTEC VIETNAM)**
Lot A-6B-CN, My Phuoc 3 Industrial Park, Ben Cat District, Binh Duong Province, Vietnam

Scope: Manufacture of Technical Rubber Products

An audit was performed, Report No. 106571. Proof has been furnished that the requirements according to ISO 9001:2008 are fulfilled.
The due date for all future audits is 04-05 (dd.mm).

Validity: The certificate is valid from 2014-06-30 until 2016-05-17.
First certification 2010

2014-06-30

TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln

DAkkS
Deutsche Akkreditierungsstelle
D-ZM-16031-04-00

ISO TYPE 5

CERTIFICATE OF CONFORMITY

Certified Product ApprovalMark™

ApprovalMark International hereby grants:

THAI DUONG JOINT STOCK COMPANY
Lot A 6B-CN, My Phuoc 3 Industrial Park
Ben Cat District, Binh Duong Province
VIETNAM

Evaluated to:

AS 1646 - 2007 Elastomeric seals for waterworks purposes

The ISO Type 5 licensee shall comply with all the terms and conditions as stipulated by the governance of the operating rules of ISO Type 5 scheme, and shall comply with standard requirement at all times including when standard is amended. The ISO Type 5 license only covers the product which is identified in the product schedule.

Certificate No. AMI 74510

Issued: 10th February 2013
Expires: 10th February 2018

John PRASAD
Certification Manager

ApprovalMark Certification

JAS-ANZ
WWW.JAS-ANZ.ORG/REGISTER

ApprovalMark

ApprovalMark International

Product Schedule

THAI DUONG RUBBER JOINT STOCK RUBBER COMPANY
Lot A 6B-CN, My Phuoc 3 Industrial Park, Ben Cat District, Binh Duong Province
VIETNAM

ISO Type 5 Certificate of Conformity

Evaluated to:

AS 1646 : 2007 Elastomeric seals for waterworks purposes

Model Id	Model Name	Brand Name	Product Description	Endorsement Date
6230xx6	AS TYTON EPDM	HULTEC	100 - 750	10th Feb 2013
6230xx4	BS TYTON EPDM	HULTEC	100 - 800	10th Feb 2013
6210xxx	AS TYTON NITRILE	HULTEC	100 - 750	10th Feb 2013
7230xxx	CI AS EPDM	HULTEC	100 - 750	10th Feb 2013
7230xx6	CI AS NITRILE	HULTEC	100 - 750	10th Feb 2013
88883xxx	PLASTYT ADAPTOR RING	HULTEC	100 - 600	10th Feb 2013
88893xxx	MULTIGIB / EZIGIB SEAL	HULTEC	80 - 250	10th Feb 2013
6310xxx	TOP GASKET, GATE VALVE	HULTEC	80 - 900	10th Feb 2013
6320xxx	BODY GASKET, GATE VALVE	HULTEC	80 - 900	10th Feb 2013
6330001	TOP COVER GASKET, H&AV ISOLATOR	HULTEC	n/a	10th Feb 2013
6330002	TOP COVER GASKET, SA FIREPLUG	HULTEC	n/a	10th Feb 2013
6330003	SEAL HOUSING GASKET, H&AV ISOLATOR	HULTEC	n/a	10th Feb 2013
6330004	TOP COVER GASKET, WA HYDRANT	HULTEC	n/a	10th Feb 2013
6340xxx	TOP GASKET, CHECK VALVE	HULTEC	100 - 150	10th Feb 2013
6350500	DN 500 / 600 BYPASS CHECKVALVE GASKET	HULTEC	n/a	10th Feb 2013
6400100	MULTITAP TOP HAT SEAL 3/4" - 1	HULTEC	n/a	10th Feb 2013
6400200	MULTI-TAP LIP SEAL 1 1/4" - 2	HULTEC	n/a	10th Feb 2013
6400806	SPRING HYDRANT SEAL 6mm THICK	HULTEC	n/a	10th Feb 2013
000829	Spring Hydrant Washer Ribbed EPDM	HULTEC	n/a	10th Feb 2013
9909xxxx	RRJ-S SINTAJOINT EPDM	HULTEC	324 - 1451	10th Feb 2013
99090000	RRJ-S SINTAJOINT EPDM STRIP	HULTEC	n/a	10th Feb 2013
5501xxxx	RRJ-D SINTAJOINT EPDM	HULTEC	762 - 1829	10th Feb 2013
88903xxx	GIBAULT EPDM	HULTEC	50 - 750	10th Feb 2013
88904xxx	GIBAULT NITRILE	HULTEC	50 - 750	10th Feb 2013
88911xxx	Pressure D/Hard SBR	HULTEC	50 - 375	10th Feb 2013
88931xxx	Blue Brute SBR	HULTEC	100 - 450	10th Feb 2013

ApprovalMark International

Product Schedule

Model Id	Model Name	Brand Name	Product Description	Endorsement Date
88921xxx	Sewer S-Type SBR	HULTEC	100 - 375	10th Feb 2013
88942xxx	Black Max Ring EPDM	HULTEC	225 - 600	10th Feb 2013
88943xxx	Black Max Ring SBR	HULTEC	225 - 600	10th Feb 2013
88900100	Iplex DWV Pan Collar	HULTEC	n/a	10th Feb 2013
6500225	Riser Cap Rubber Ring	HULTEC	n/a	10th Feb 2013
89000025	SWV PLUG WASHER	HULTEC	n/a	10th Feb 2013
88980100	Pancollar Seal - Vx	HULTEC	n/a	10th Feb 2013
88961xxx	POLY SBR	HULTEC	50 - 375	10th Feb 2013
88951xxx	VINYL IRON SBR	HULTEC	100 - 375	10th Feb 2013
88991xxx	ULTRA RIB SBR	HULTEC	150 - 375	10th Feb 2013
88975xxx	VINITITE SBR (Sewer)	HULTEC	100 - 300	10th Feb 2013
88401xxx	POLYPRO RING SBR	HULTEC	150 - 900	10th Feb 2013
000113	A1 Sureseal NBR	HULTEC	n/a	10th Feb 2013
9224xxxx	REPAIR MAT (80)	HULTEC	238 - 1400	10th Feb 2013
9124xxxx	REPAIR MAT (135)	HULTEC	238 - 1400	10th Feb 2013
3xxxxxxx	REPAIR MAT - CASCADE	HULTEC	238 - 1400	10th Feb 2013
9230100	100mm DWV	HULTEC	n/a	10th Feb 2013
11xxxxx	Z RING SBR	HULTEC	50 - 375	10th Feb 2013
1012041	ORING (41mm X 8.5mm)	HULTEC	n/a	10th Feb 2013
1012062	ORING (62mm X 11mm)	HULTEC	n/a	10th Feb 2013
1013005	LIPSEAL RING SMALL	HULTEC	n/a	10th Feb 2013
1013010	LIPSEAL RING LARGE	HULTEC	n/a	10th Feb 2013
10110xx	TAP / BAND TAPTITE NUT	HULTEC	20 - 25	10th Feb 2013
000773	SPRING HYDRANT WASHER FLAT	HULTEC	n/a	10th Feb 2013
7210xxx	GRIPTITE EPDM	HULTEC	80 - 600	10th Feb 2013
7220xxx	NORTITE EPDM	HULTEC	80 - 375	10th Feb 2013
7240xxx	MECHANICAL JOINT EPDM	HULTEC	80 - 600	10th Feb 2013
7250xxx	AF MFJ Short	HULTEC	80 - 200	10th Feb 2013
7260xxx	AF MFJ STD	HULTEC	80 - 600	10th Feb 2013
7270xxx	WTRP EPDM	HULTEC	100 - 200	10th Feb 2013

End of record

Certificate No: AMI 74510

The models identified above in the schedule are endorsed for Type 5 application

hultec
ISO 9001 CERTIFIED
HULES TECNICOS
San José Costa Rica

1/1

CERTIFIED ISO-9001 INTERTEK

TERRAMIX, S.A. / HULTEC
TECHNICAL DEPARTMENT
Laboratory Report
Apr 2, 2015

Compound: HT5557
Product : **PolyPro Spigot** Gaskets
Manufacturing Location: Hultec Vietnam
Client : Vinidex

Properties	Units	Method	Specification AS686-1/AS1646	Results
Hardness IRHD	IRHD	ISO48	55+/-5	53
Tensile Strength	MPa	ISO37	9 min	10.7
Ultimate Elongation	%	ISO37	300 min	470
O_3 Resistance 48h @ 40°C 50pphm 20% elongation	Appearance	ISO1431-1	No Cracks	No Cracks
Compression Set 24h @ 70°C 25% def	%	ISO815	20 max	14.1
Compression Set after 72h @ 23°C 25% def	%	ISO815	12 max	6.5
Compression Set after 72h @ -10°C	%	ISO815	40max	14.6
Water immersion 7d @ 70°C, Volume Change	%	ISO1817	+8/-1 max	0.4
Accelerated Ageing 7d @ 70°C	%	ISO188		
Hardness Change, IRHD	Points		+8/-5 max	+1
Tensile Change	%		-20 max	-6.5
Elongation Change	%		+10/-30 max	3.8
Rate of Compression Stress Relaxation		ISO3384	-	
after 7 days @ 23°C, rate	%		14 max	6.7
after 100 days @ 23°C, rate	%		20 max	19.4

GALINA POTASKOUEV
Manager
Laboratory R&D Chemical Division

Certificate ZA13/208253

The management system of

Cascade Control (Pty) Ltd

183 Elsburg Road, Delville Ext 4, Germiston, Gauteng,1401

has been assessed and certified as meeting the requirements of

ISO 9001:2008

For the following activities

Manufacture and distribution of stainless steel pipe repair clamps

Exclusion: 7.3 Design and development

This certificate is valid from 22 July 2013 until 22 July 2016 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 23 April 2016
Issue 1. Certified since July 2013

Authorised by

C02a

SGS South Africa Systems & Services Certification
PO Box 82612 Southdale 2135, 58 Melvill Street Boeyens Johannesburg 2001 South Africa
T +27 (0) 11 661 2500 f+(0) 11 661 2643 www.sgs.com

Page 1 of 1

STANDARDSMARK LICENCE

SAI Global hereby grants:

Cascade Control (Pty) T/A Rapid Clamps

Cascade House, 183 Elsburg Road, Deville Ext 4, Germiston, South Africa

StandardsMark Licence

Manufactured to:

AS 4181-1999 - Stainless steel clamps for waterworks purposes

"the StandardsMark Licensee" the right to use the STANDARDSMARK as shown below only in respect of the goods described and detailed in the Schedule which are produced by the Licensee or on behalf of the Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the STANDARDSMARK and the Terms and Conditions for certification and licence. The Licensee covenants to comply with all the Rules and Terms and Conditions.

Certificate No:SMK02626

Issued: 4 May 2012
Expires: 1 October 2017

Originally Certified: 2 October 2002
Current Certification: 4 May 2012

Duncan Lilley
Global Head – Assurance Services

William Smith
Certification Manager

Certified Product™ Australian Standard

JAS-ANZ
WWW.JAS-ANZ.ORG/REGISTER

*** For details of manufacture, refer to the licensee**

The STANDARDSMARK is a registered certification trademark of SAI Global Limited (A.C.N. 050 644 642) and is issued under licence by SAI Global Certification Services Pty Limited (ACN 108 716 669) ("SAI Global") 286 Sussex Street, Sydney NSW 2000, GPO Box 5420 Sydney NSW 2001. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. Refer to www.saiglobal.com, for the list of product models.

SAI GLOBAL
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SCHEDULE TO

STANDARDSMARK LICENCE

SAI Global hereby grants:

Cascade Control (Pty) T/A Rapid Clamps

Cascade House, 183 Elsburg Road, Deville Ext 4, Germiston, South Africa

StandardsMark Licence

Manufactured to:

AS 4181-1999 - Stainless steel clamps for waterworks purposes

Model identification of the goods on which the STANDARDSMARK may be used:

Model Identification	Model Name	Brand Name	Product Description	Date Endorsed
CFO1-12	N/A	Rapid	Flanged Off Take Clamps 1 part 300mm	4 Dec 2009
CFO1-16	N/A	Rapid	Flanged Off Take Clamps 1 part 400mm	4 Dec 2009
CFO1-24	N/A	Rapid	Flanged Off Take Clamps 1 part 600mm	4 Dec 2009
CFO2-16	N/A	Rapid	Flanged Off Take Clamps 2 part 400mm	4 Dec 2009
CFO2-24	N/A	Rapid	Flanged Off Take Clamps 2 part 600mm	4 Dec 2009
CR1-12	N/A	Rapid	Repair Clamps 1 part 300mm	4 Dec 2009
CR1-16	N/A	Rapid	Repair Clamps 1 part 400mm	4 Dec 2009
CR1-24	N/A	Rapid	Repair Clamps 1 part 600mm	4 Dec 2009
CR1-6	N/A	Rapid	Repair Clamps 1 part 150mm	4 Dec 2009
CR1-8	N/A	Rapid	Repair Clamps 1 part 200mm	4 Dec 2009
CR2-12	N/A	Rapid	Repair Clamps 2 part 300mm	4 Dec 2009
CR2-16	N/A	Rapid	Repair Clamps 2 part 400mm	4 Dec 2009
CR2-24	N/A	Rapid	Repair Clamps 2 part 600mm	4 Dec 2009
CTR1-12	N/A	Rapid	Boss BSP Clamps 1 part 300mm	4 Dec 2009
CTR1-16	N/A	Rapid	Boss BSP Clamps 1 part 400mm	4 Dec 2009

Certificate No: SMK02626 Issued Date: 4 May 2012

This schedule supersedes all previously issued schedules

*** For details of manufacture, refer to the licensee**

SAI GLOBAL INFORM. INSPIRE. IMPROVE.

SCHEDULE TO
STANDARDSMARK LICENCE

Model Identification	Model Name	Brand Name	Product Description	Date Endorsed
CTR1-24	N/A	Rapid	Boss BSP Clamps 1 part 600mm	4 Dec 2009
CTR1-6	N/A	Rapid	Boss BSP Clamps 1 part 150mm	4 Dec 2009
CTR1-8	N/A	Rapid	Boss BSP Clamps 1 part 200mm	4 Dec 2009
CTR2-16	N/A	Rapid	Boss BSP Clamps 2 part 400mm	4 Dec 2009
CTR2-24	N/A	Rapid	Boss BSP Clamps 2 part 600mm	4 Dec 2009

End of Record

Certificate No: SMK02626 Issued Date: 4 May 2012

This schedule supersedes all previously issued schedules

*** For details of manufacture, refer to the licensee**

SAI GLOBAL
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CERTIFICATE OF REGISTRATION

This is to certify that:

Rodney Industries

ABN 42 000 664 942

19 Valente Close Chermside QLD 4032 AUSTRALIA

operates a

QUALITY MANAGEMENT SYSTEM

which complies with the requirements of

ISO 9001:2008

for the following scope

The modification , configuration design and fabrication of metals, polyethylene and polypropylene products, particularly for the transportation of fluids in infrastructure, irrigation, mining and general industries.

Certificate No: QEC28136

Issued: 30 August 2014
Expires: 4 October 2017

Originally Certified: 5 October 2011
Current Certification: 27 August 2014

Samer Chaouk
Head of Policy, Risk and Certification

Paul Butcher
Global Head – Assurance Services

Certified System ISO 9001

JAS-ANZ
WWW.JAS-ANZ.ORG/REGISTER

Registered by:
SAI Global Certification Services Pty Ltd (ACN 108 716 669) 680 George Street Sydney NSW 2000 Australia with SAI Global Limited 680 George Street Sydney NSW 2000 Australia ("SAI Global") and subject to the SAI Global Terms and Conditions for Certification. While all due care and skill was exercised in carrying out this assessment, SAI Global accepts responsibility only for proven negligence. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. To verify that this certificate is current please refer to SAI Global On-Line Certification register at http://www.saiglobal.com

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ROTADYNE PTY. LTD.

31-43 Power Street

St Marys NSW 2760

Tel; 02 9623 8877

Fax; 02 9623 6810

QUALITY ASSURANCE MANUAL

2014

BUREAU VERITAS
Certification

Certification

Awarded to

UNIPLAS MOULDING INTERNATIONAL PTY LTD

UNIT 2A/5 WENBAN PLACE, WETHERILL PARK 2164

NEW SOUTH WALES, AUSTRALIA

Bureau Veritas certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

STANDARD

AS/NZS ISO 9001:2008

QUALITY MANAGEMENT SYSTEMS

SCOPE OF SUPPLY

MANUFACTURE OF PLASTIC INJECTION MOULDED COMPONENTS

Approval Date : **15 MARCH 2013**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until : **15 MARCH 2016**

First Original Approval Date: **09 JULY 1998**

Last Expiry Date: **23 JANUARY 2013** *Date of last Recertification audit:* **27 FEBRUARY 2013**

To check the validity of this certificate please call : **Bureau Veritas Australia Pty Ltd**
Further clarification regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation

Certificate Number: **AUS13000063** *Date:* **15 MARCH 2013**

Andrew Mortimore
General Manager - Bureau Veritas Certification

JAS-ANZ

www.jas-anz.org/register

Managing office: Bureau Veritas Pty Ltd, 3/435 Williamstown Road, Port Melbourne, Victoria, 3207

Issuing office: Bureau Veritas Pty Ltd, 3/435 Williamstown Road, Port Melbourne, Victoria, 3207

STANDARDSMARK LICENCE

SAI Global hereby grants:

Vinidex Pty Ltd

ABN 42 000 664 942

Extrusion, 254 Woodpark Road, Smithfield, NSW 2164, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 1260:2009 - PVC-U pipes and fittings for drain, waste and vent application

"the StandardsMark Licensee" the right to use the STANDARDSMARK as shown below only in respect of the goods described and detailed in the Schedule which are produced by the Licensee or on behalf of the Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the STANDARDSMARK and the Terms and Conditions for certification and licence. The Licensee covenants to comply with all the Rules and Terms and Conditions.

Certificate No:SMK1246

Issued: 21 March 2012
Expires: 26 July 2016

Originally Certified: 28 July 1993
Current Certification: 21 March 2012

Duncan Lilley
Global Head – Assurance Services

William Smith
Certification Manager

Certified Product™ Australian Standard

JAS-ANZ
WWW.JAS-ANZ.ORG/REGISTER

*** For details of manufacture, refer to the licensee**

The STANDARDSMARK is a registered certification trademark of SAI Global Limited (A.C.N. 050 644 642) and is issued under licence by SAI Global Certification Services Pty Limited (ACN 108 716 669) ("SAI Global") 680 George Street, Sydney NSW 2000, GPO Box 5420 Sydney NSW 2001. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. Refer to www.saiglobal.com, for the list of product models.

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APPENDIX C - WSAA PRODUCT SPECIFICATION

PRODUCT SPECIFICATION

WSA PS – 240 POLYPROPYLENE (PP), RIBBED CONSTRUCTION, PIPES AND FITTINGS FOR NON-PRESSURE APPLICATIONS - SEWERAGE

240.1 SCOPE

This specification covers polypropylene (PP) ribbed-construction non-pressure pipes and fittings for use in gravity sewerage.

240.2 REQUIREMENTS

(a) PP pipes and fittings shall be Type B ID Series complying with AS/NZS 5065:2005/Amdt 1:2010.

(b) Pipe Stiffness Class shall be SN10.

(c) Elastomeric joint seals shall be EPDM or CR or SBR complying with AS 1646:2007 and AS 681.1:2008 (EN 681-1:1996).

240.3 QUALITY ASSURANCE

(a) PP pipes and fittings shall have product certification (ISO Type 5) to AS/NZS 5065:2005/Amdt 1:2010.

(b) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646:2007 and AS 681.1:2008 (EN 681-1:1996).

(c) All products shall be marked in accordance with the conformity assessment body's requirements

240.4 AGENCY OR PROJECT SPECIFIC REQUIREMENTS

Dimensions (e.g. Type B OD Series)	
Stiffness Class[1], SN	
Alternative elastomeric materials for joint seals (e.g. NBR)	

NOTE:

1 Where not SN10, Stiffness Class shall be as specified in the Project Specification or on the Design Drawings.

APPENDIX D – FITTINGS SUPPLIED BY RAPID CLAMPS

This Appendix comprises the following:

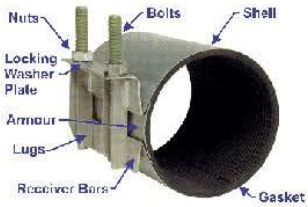
a) Specification for Stainless Steel 316 Repair Clamp (1 page)

b) Stainless Steel 316 Repair Clamps (one, two and three parts) (5 pages)

c) Stainless Steel 316 Sewer OB Junction Clamps (1 page)

APPENDIX D1 - SPECIFICATION FOR STAINLESS STEEL 316 REPAIR CLAMP

SPECIFICATIONS for Rapid Single & Multi Part 316 Stainless Steel Clamps



WaterMark
AS4181
Lic. WM 74602*

Grade of stainless steel, Type 316. Fully passivized after welding, to restore the original passive state of the 316 stainless steel.

LOCKING WASHER PLATE: Locks into position for easy tightening of nuts.
LUGS: MIG-welded to receiver bar and fully passivized after welding. Leading edge is rounded to prevent them from catching bolt bars during installation.
SHELL: 2B finish.
BOLTS: Thread-rolled for strength and coated to prevent galling. Bolts are MIG-welded to the receiver bar and fully passivized after welding.
NUTS/WASHERS: Type 316 stainless steel.
RECEIVER BARS: TIG-welded to shell to form a strong fusion, and fully passivized after welding.
GASKET: Nitrile rubber is specially formulated for water service incorporating antioxidant agents to increase shelf life. All gaskets have a gridded design, tapered ends and vulcanized armour plates for easy installation and optimum sealing efficiency. Natural rubber is available on request.
ARMOUR: Heavy gauge 316 stainless steel vulcanized into the gasket at the time of moulding.
(Specifications are subject to change without notice).

GENERAL INFORMATION

Dimensions:
(a) 150mm & 200mm length clamps, 2 x M12 bolts up to OD 104mm, M16 bolts per part OD 105mm and larger.
(b) 300mm length clamps 3 x M16 bolts per part up to OD 249mm, 4 x M16 bolts per part OD250mm and larger.
(c) 400mm length clamps 4 x M16 bolts per size op to OD 249mm, 5 x M16 bolts per part OD 250mm and larger.
(d) 600mm length clamps 6 x M12 bolts up to OD 104mm, 6 x M16 bolts per part up to OD 249mm, 8 x M16 bolts 250mm and larger

Recommended pressure ratings:
(a) Clamps to suit pipes above DN50mm - 350mm nominal size = 1.6 MPa.*
(b) Clamps to suit pipes above DN375mm - 600mm nominal size = 1.2 MPa.*
(c) Clamps to suit pipes above DN625mm - 900mm nominal size = 0.8 MPa.*
(d) Clamps to suit pipes above DN925mm - 1200mm nominal size = 0.6 MPa.*

Maximum Temperature: 0 - 60 degrees C.*

1. The amount of pressure that a full circle repair clamp will contain is proportionate to the diameter of the pipe being repaired and the amount of torque applied to the bolts. Smaller diameter repair clamps will contain higher pressure than larger diameter repair clamps. Cleaning and lubricating pipe/gasket, will reduce friction between the pipe surface and sealing gasket, creating a better seal. Use soapy water or pipe lubricate.
2. The pressure containing capability of a repair clamp is influenced by the pipe size, the type and extent of damage to the pipe, environment and service conditions and installation workmanship.
3. Recommended Clamp lengths:
   The general recommendation is that the clamp length should be twice the pipe diameter. The clamp length should not be less than the diameter of the pipe.
   (a) In the case of longitudinal damage, we recommend a clamp length equal to 4 times the length of the damage section of the pipe.
   (b) Where a large section of the pipe wall is broken away, a section of thin gauge sheet metal should be placed over the opening to provide a sealing surface for the gasket.
4. Stainless Steel Repair Clamps do not restrain axial pipe movement.
   (Suitable anchorage must be provided where pipe movement may occur.)

*Pressure ratings may vary due to pipe condition and type. Refer to AS4181-1999. Not recommended for low stiffness factor pipes below SN7500. Re-tension clamp at Max. operating temp. AS4181-1999 up to and including DN350mm clamps.
E & OE

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APPENDIX D2 - STAINLESS STEEL 316 REPAIR CLAMPS (SINGLE, DOUBLE AND MULTI-PART)

CR REPAIR CLAMPS ONE PART

Part No.	Range (mm)	Clamp Length (mm)	Bolt size x No. of bolts
CR1-0220-06	45 - 51	150	M12 x 2
CR1-0220-08	45 - 51	200	M12 x 2
CR1-0220-12	45 - 51	300	M12 x 3
CR1-0220-16	45 - 51	400	M12 x 4
CR1-0220-24	45 - 51	600	M12 x 6
CR1-0238-06	59 - 67	150	M12 x 2
CR1-0238-08	59 - 67	200	M12 x 2
CR1-0238-12	59 - 67	300	M12 x 3
CR1-0238-16	59 - 67	400	M12 x 4
CR1-0238-24	59 - 67	600	M12 x 6
CR1-0288-06	69 - 76	150	M12 x 2
CR1-0288-08	69 - 76	200	M12 x 2
CR1-0288-12	69 - 76	300	M12 x 3
CR1-0288-16	69 - 76	400	M12 x 4
CR1-0288-24	69 - 76	600	M12 x 6
CR1-0300-06	75 - 83	150	M12 x 2
CR1-0300-08	75 - 83	200	M12 x 2
CR1-0300-12	75 - 83	300	M12 x 3
CR1-0300-16	75 - 83	400	M12 x 4
CR1-0300-24	75 - 83	600	M12 x 6
CR1-0350-06	85 - 95	150	M12 x 2
CR1-0350-08	85 - 95	200	M12 x 2
CR1-0350-12	85 - 95	300	M12 x 3
CR1-0350-16	85 - 95	400	M12 x 4
CR1-0350-24	85 - 95	600	M12 x 6
CR1-0375-06	95 - 104	150	M12 x 2
CR1-0375-08	95 - 104	200	M12 x 2
CR1-0375-12	95 - 104	300	M12 x 3
CR1-0375-16	95 - 104	400	M12 x 4
CR1-0375-24	95 - 104	600	M12 x 6
CR1-0440-06	104 - 113	150	M12 x 2
CR1-0440-08	104 - 113	200	M12 x 2
CR1-0440-12	104 - 113	300	M12 x 3
CR1-0440-16	104 - 113	400	M12 x 4
CR1-0440-24	104 - 113	600	M12 x 6
CR1-0445-08	110 - 120	200	M16 x 2
CR1-0445-12	110 - 120	300	M16 x 3
CR1-0445-16	110 - 120	400	M16 x 4
CR1-0445-24	110 - 120	600	M16 x 6
CR1-0450-08	113 - 123	200	M16 x 2
CR1-0450-12	113 - 123	300	M16 x 3
CR1-0450-16	113 - 123	400	M16 x 4
CR1-0450-24	113 - 123	600	M16 x 6
CR1-0480-08	121 - 130	200	M16 x 2
CR1-0480-12	121 - 130	300	M16 x 3
CR1-0480-16	121 - 130	400	M16 x 4
CR1-0480-24	121 - 130	600	M16 x 6
CR1-0500-08	126 - 136	200	M16 x 2
CR1-0500-12	126 - 136	300	M16 x 3
CR1-0500-16	126 - 136	400	M16 x 4
CR1-0500-24	126 - 136	600	M16 x 6

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CR REPAIR CLAMPS ONE PART

Part No.	Range (mm)	Clamp Length (mm)	Bolt size x No. of bolts
CR1-0520-08	130 - 140	200	M16 x 2
CR1-0520-12	130 - 140	300	M16 x 3
CR1-0520-16	130 - 140	400	M16 x 4
CR1-0520-24	130 - 140	600	M16 x 6
CR1-135/145-08	135 - 145	200	M16 x 2
CR1-135/145-12	135 - 145	300	M16 x 3
CR1-135/145-16	135 - 145	400	M16 x 4
CR1-135/145-24	135 - 145	600	M16 x 6
CR1-0590-08	145 - 155	200	M16 x 2
CR1-0590-12	145 - 155	300	M16 x 3
CR1-0590-16	145 - 155	400	M16 x 4
CR1-0590-24	145 - 155	600	M16 x 6
CR1-0600-08	151 - 161	200	M16 x 2
CR1-0600-12	151 - 161	300	M16 x 3
CR1-0600-16	151 - 161	400	M16 x 4
CR1-0600-24	151 - 161	600	M16 x 6
CR1-160/170-08	160 - 170	200	M16 x 2
CR1-160/170-12	160 - 170	300	M16 x 3
CR1-160/170-16	160 - 170	400	M16 x 4
CR1-160/170-24	160 - 170	600	M16 x 6
CR1-0663-08	167 - 178	200	M16 x 2
CR1-0663-12	167 - 178	300	M16 x 3
CR1-0663-16	167 - 178	400	M16 x 4
CR1-0663-24	167 - 178	600	M16 x 6
CR1-0690-08	174 - 183	200	M16 x 2
CR1-0690-12	174 - 183	300	M16 x 3
CR1-0690-16	174 - 183	400	M16 x 4
CR1-0690-24	174 - 183	600	M16 x 6
CR1-0745-08	189 - 199	200	M16 x 2
CR1-0745-12	189 - 199	300	M16 x 3
CR1-0745-16	189 - 199	400	M16 x 4
CR1-0745-24	189 - 199	600	M16 x 6
CR1-0790-08	196 - 205	200	M16 x 2
CR1-0790-12	196 - 205	300	M16 x 3
CR1-0790-16	196 - 205	400	M16 x 4
CR1-0790-24	196 - 205	600	M16 x 6
CR1-0800-08	202 - 212	200	M16 x 2
CR1-0800-12	202 - 212	300	M16 x 3
CR1-0800-16	202 - 212	400	M16 x 4
CR1-0800-24	202 - 212	600	M16 x 6
CR1-0863-08	218 - 228	200	M16 x 2
CR1-0863-12	218 - 228	300	M16 x 3
CR1-0863-16	218 - 228	400	M16 x 4
CR1-0863-24	218 - 228	600	M16 x 6
CR1-0900-08	229 - 238	200	M16 x 2
CR1-0900-12	229 - 238	300	M16 x 3
CR1-0900-16	229 - 238	400	M16 x 4
CR1-0900-24	229 - 238	600	M16 x 6
CR1-0905-08	236 - 245	200	M16 x 2
CR1-0905-12	236 - 245	300	M16 x 3
CR1-0905-16	236 - 245	400	M16 x 4
CR1-0905-24	236 - 245	600	M16 x 6

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CR REPAIR CLAMPS ONE PART

Part No.	Range (mm)	Clamp Length (mm)	Bolt size x No. of bolts
CR1-1000-12	248 - 257	300	M16 x 4
CR1-1000-16	248 - 257	400	M16 x 5
CR1-1000-24	248 - 257	600	M16 x 8
CR1-1040-12	255 - 265	300	M16 x 4
CR1-1040-16	255 - 265	400	M16 x 5
CR1-1040-24	255 - 265	600	M16 x 8
CR1-1075-12	271 - 281	300	M16 x 4
CR1-1075-16	271 - 281	400	M16 x 5
CR1-1075-24	271 - 281	600	M16 x 8
CR1-1110-12	281 - 290	300	M16 x 4
CR1-1110-16	281 - 290	400	M16 x 5
CR1-1110-24	281 - 290	600	M16 x 8
CR1-1140-12	288 - 298	300	M16 x 4
CR1-1140-16	288 - 298	400	M16 x 5
CR1-1140-24	288 - 298	600	M16 x 8
CR1-1175-12	298 - 309	300	M16 x 4
CR1-1175-16	298 - 309	400	M16 x 5
CR1-1175-24	298 - 309	600	M16 x 8
CR1-1200-12	304 - 314	300	M16 x 4
CR1-1200-16	304 - 314	400	M16 x 5
CR1-1200-24	304 - 314	600	M16 x 8
CR1-1220-12	312 - 322	300	M16 x 4
CR1-1220-16	312 - 322	400	M16 x 5
CR1-1220-24	312 - 322	600	M16 x 8
CR1-1275-12	322 - 331	300	M16 x 4
CR1-1275-16	322 - 331	400	M16 x 5
CR1-1275-24	322 - 331	600	M16 x 8
CR1-1320-12	325 - 335	300	M16 x 4
CR1-1320-16	325 - 335	400	M16 x 5
CR1-1320-24	325 - 335	600	M16 x 8
CR1-1340-12	332 - 342	300	M16 x 4
CR1-1340-16	332 - 342	400	M16 x 5
CR1-1340-24	332 - 342	600	M16 x 8
CR1-1370-12	343 - 355	300	M16 x 4
CR1-1370-16	343 - 355	400	M16 x 5
CR1-1370-24	343 - 355	600	M16 x 8
CR1-1400-16	356 - 366	400	M16 x 5
CR1-1400-24	356 - 366	600	M16 x 8

Rapid Clamps

CR REPAIR CLAMPS TWO PART
OTHER SIZES AND LENGTHS AVAILABLE

PART NO	RANGE	Clamp Length (mm)	Bolt size x No. of bolts
CR2-250/270-16	250 - 270	400	M16 x 10
CR2-250/270-24	250 - 270	600	M16 x 16
CR2-270/290-16	270 - 290	400	M16 x 10
CR2-270/290-24	270 - 290	600	M16 x 16
CR2-290/310-16	290 - 310	400	M16 x 10
CR2-290/310-24	290 - 310	600	M16 x 16
CR2-310/330-16	310 - 330	400	M16 x 10
CR2-310/330-24	310 - 330	600	M16 x 16
CR2-330/350-16	330 - 350	400	M16 x 10
CR2-330/350-24	330 - 350	600	M16 x 16
CR2-350/370-16	350 - 370	400	M16 x 10
CR2-350/370-24	350 - 370	600	M16 x 16
CR2-370/390-16	370 - 390	400	M16 x 10
CR2-370/390-24	370 - 390	600	M16 x 16
CR2-390/410-16	390 - 410	400	M16 x 10
CR2-390/410-24	390 - 410	600	M16 x 16
CR2-400/420-16	400 - 420	400	M16 x 10
CR2-400/420-24	400 - 420	600	M16 x 16
CR2-420/440-16	420 - 440	400	M16 x 10
CR2-420/440-24	420 - 440	600	M16 x 16
CR2-440/460-16	440 - 460	400	M16 x 10
CR2-440/460-24	440 - 460	600	M16 x 16
CR2-450/470-16	450 - 470	400	M16 x 10
CR2-450/470-24	450 - 470	600	M16 x 16
CR2-470/490-16	470 - 490	400	M16 x 10
CR2-470/490-24	470 - 490	600	M16 x 16
CR2-480/500-16	480 - 500	400	M16 x 10
CR2-480/500-24	480 - 500	600	M16 x 16
CR2-490/510-16	490 - 510	400	M16 x 10
CR2-490/510-24	490 - 510	600	M16 x 16
CR2-510/530-16	510 - 530	400	M16 x 10
CR2-510/530-24	510 - 530	600	M16 x 16
CR2-530/550-16	530 - 550	400	M16 x 10
CR2-530/550-24	530 - 550	600	M16 x 16
CR2-550/570-16	550 - 570	400	M16 x 10
CR2-550/570-24	550 - 570	600	M16 x 16
CR2-570/590-16	570 - 590	400	M16 x 10
CR2-570/590-24	570 - 590	600	M16 x 16
CR2-580/600-16	580 - 600	400	M16 x 10
CR2-580/600-24	580 - 600	600	M16 x 16
CR2-600/620-16	600 - 620	400	M16 x 10
CR2-600/620-24	600 - 620	600	M16 x 16
CR2-620/640-16	620 - 640	400	M16 x 10
CR2-620/640-24	620 - 640	600	M16 x 16

CR REPAIR CLAMPS THREE PART
OTHER SIZES AND LENGTHS AVAILABLE

PART NO	RANGE	Clamp Length (mm)	Bolt size x No. of bolts
CR3-490/520-16	490 - 520	400	M16 x 15
CR3-490/520-24	490 - 520	600	M16 x 24
CR3-520/550-16	520 - 550	400	M16 x 15
CR3-520/550-24	520 - 550	600	M16 x 24
CR3-550/580-16	550 - 580	400	M16 x 15
CR3-550/580-24	550 - 580	600	M16 x 24
CR3-560/590-16	560 - 590	400	M16 x 15
CR3-560/590-24	560 - 590	600	M16 x 24
CR3-590/620-16	590 - 620	400	M16 x 15
CR3-590/620-24	590 - 620	600	M16 x 24
CR3-610/640-16	610 - 640	400	M16 x 15
CR3-610/640-24	610 - 640	600	M16 x 24
CR3-650/680-16	650 - 680	400	M16 x 15
CR3-650/680-24	650 - 680	600	M16 x 24
CR3-690/720-16	690 - 720	400	M16 x 15
CR3-690/720-24	690 - 720	600	M16 x 24
CR3-720/750-16	720 - 750	400	M16 x 15
CR3-720/750-24	720 - 750	600	M16 x 24
CR3-750/780-16	750 - 780	400	M16 x 15
CR3-750/780-24	750 - 780	600	M16 x 24
CR3-780/810-16	780 - 810	400	M16 x 15
CR3-780/810-24	780 - 810	600	M16 x 24

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APPENDIX D3 - STAINLESS STEEL 316 SEWER OB JUNCTION CLAMPS

Sewer OB Junction Clamps (CBJ)

Rapid Sewer OB Junction clamps are made from 316 Stainless Steel, they are ideally suited for new or damaged property connections on non-pressure sewer pipelines designed for a permanent sewer branch.

They are made to provide the same quick-and-easy Rapid fitting qualities. All of the Rapid Sewer Junction Clamps are made using AS 4181 requirements* and in accordance with ISO 9001 quality standards. They provide a simple and permanent way of connecting branch off-takes to new, broken, and renewed/re-lined sewer pipes. The standard sewer clamps come with the off- take branch at 45 degrees, and has an uPVC access coupling secured to it for solvent welded connections to uPVC pipes. The sewer clamps are made to adapt to pipe ovality and irregularities. With a fully lined rubber gasket, damaged pipes can be easily rehabilitated.

Sizes range from DN 150 to DN 600mm, with off takes sizes DN 100 and DN 150mm. (Depending on host pipe) Operating pressure from -80kPA to 100kPA. Max. temp. 60 degrees C.

COMMON RAPID OB SEWER CLAMPS

PART NO	OD RANGE	DESCRIPTION
CBJ-160/170-100	160 - 170	OB SS316 CLAMP 160 to 170 x 100 x 45 uPVC
CBJ-175/185-100	175 - 185	OB SS316 CLAMP 175 to 185 x 100 x 45 uPVC
CBJ-190/210-100	190 - 210	OB SS316 CLAMP 190 to 210 x 100 x 45 uPVC
CBJ-190/210-150	190 - 210	OB SS316 CLAMP 190 to 210 x 150 x 45 uPVC
CBJ-225/245-100	225 - 245	OB SS316 CLAMP 225 to 245 x 100 x 45 uPVC
CBJ-225/245-150	225 - 245	OB SS316 CLAMP 225 to 245 x 150 x 45 uPVC
CBJ-250/270-100	250 - 270	OB SS316 CLAMP 250 to 270 x 100 x 45 uPVC
CBJ-250/270-150	250 - 270	OB SS316 CLAMP 250 to 270 x 150 x 45 uPVC
CBJ-270/290-100	270 - 290	OB SS316 CLAMP 270 to 290 x 100 x 45 uPVC
CBJ-270/290-150	270 - 290	OB SS316 CLAMP 270 to 290 x 150 x 45 uPVC
CBJ-310/330-100	310 - 330	OB SS316 CLAMP 310 to 330 x 100 x 45 uPVC
CBJ-310/330-150	310 - 330	OB SS316 CLAMP 310 to 330 x 150 x 45 uPVC

Larger host pipe sizes available.

*AS4181 pressure testing requirements reduced

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APPENDIX E - SUPPLIER CONTACTS

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Market Development Engineer
Vinidex Pty Ltd
224 Musgrave Road, Coopers Plains QLD 4108
PO Box 379, Sunnybank 4109 QLD
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Mobile: 0407 622 552
Fax: (07) 3277 9500
Email: ipaterson@vinidex.com.au

Rapid Clamps (Pty) Ltd
Queensland Office:
56/193 Southpine Road
Brendale QLD 4500
Phone: 1300 781 769 or (07) 3889 6262
Fax: (07) 3889 6272
Other States and Territories:
Phone/Fax: 1300 098 966
All Email: sales@rapidclamps.com

Neil Alchin
Hultec Asia Pacific Pty Ltd
85 Christie Street
St Marys, NSW 2760
Phone: (02) 8803-4143
Fax: (02) 9833 9977
Email: nalchin@hultec.com.au

APPENDIX F – HYDROTITE HYDROPHILIC CHLOROPRENE RUBBER WATERSTOP

CORKJOINT
THE FORCE IN JOINTING SOLUTIONS

HYDROTITE
HYDROPHILIC CHLOROPRENE RUBBER WATERSTOP

PRODUCT DESCRIPTION

Hydrotite is the brand name for a state of the art hydrophilic waterstop with unmatched durability and water sealing capacity. Hydrotite expands as it absorbs water and fills up concrete joint gaps conforming to the gap variation, ensuring excellent sealing. Hydrotite is based on the technology of hydrophilics, a material which expands in a controlled fashion by approximately eight times by volume in the presence of moisture to create a pressure seal within the joint. When properly installed, Hydrotite is capable of sealing heads of water up to 50 metres and is used extensively throughout the construction industry to seal horizontal and vertical construction joints for poured in-situ concrete.

Hydrotite consists of a unique combination of expanding hydrophilic materials and non-expanding chloroprene rubber co-extruded together to form a single strip. The expanding section is blue with the non-expanding section being black. The co-extruded design means that the expansion is directed across the joint for maximum sealing performance.This expansion creates an effective compression seal within joints which shuts out the water path. Upon expansion Hydrotite turns from a dark blue colour to a light blue colour so that a visual inspection of the Hydrotite can be made and the contractor can see if the Hydrotite has pre-expanded.

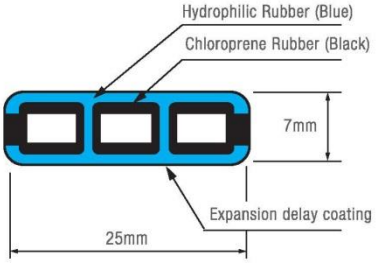
Contractors require an economical waterstop that is easy to install and needs to perform over a long period of time maintaining joint integrity. Recognised world wide, Hydrotite has a proven track record as a high quality and cost effective solution to water containment needs.

Hydrotite is treated with a delay coating to prevent it from absorbing water from the moist green concrete, to help stop any premature expansion should the joint become ponded with water prior to the second pour and to stop any premature expansion taking place before curing of the concrete.

Hydrotite, as with any hydrophilic waterstop will return to its original size if there is no more water or moisture present. Hydrotite will then re-expand when water or moisture is again introduced to the joint. Some leakage may occur before Hydrotite re-expands fully. Repeated wet and dry cycling of this nature does not effect the functioning of Hydrotite.

The standard dimension and shape of CJ-0725-3K is as per fig. 1

Fig. 1 Hydrotite CJ-0725-3K



ADVANTAGES

- Easy to handle and install
- Excellent adhesion to concrete surfaces
- Outstanding physical properties
- Profiles with self adhesive backing allow for simple and fast installation processes
- Co-extruded design means expansion is directed across the joint for maximum seal
- Unaffected by repeated wet and dry cycles
- No site welding is required for joining processes
- Has a delay coating to help prevent premature expansion
- Extra delay coating is available for very wet conditions, if required
- Changes colour as a visual alert to let you know it has expanded
- No need for special intersections, joining is by simple butt joins
- Can be applied to rough surfaces using Leakmaster gun grade waterstop
- Can be joined to traditional PVC waterstop
- No compaction or displacement problems
- Non toxic and non hazardous
- No need for split forming

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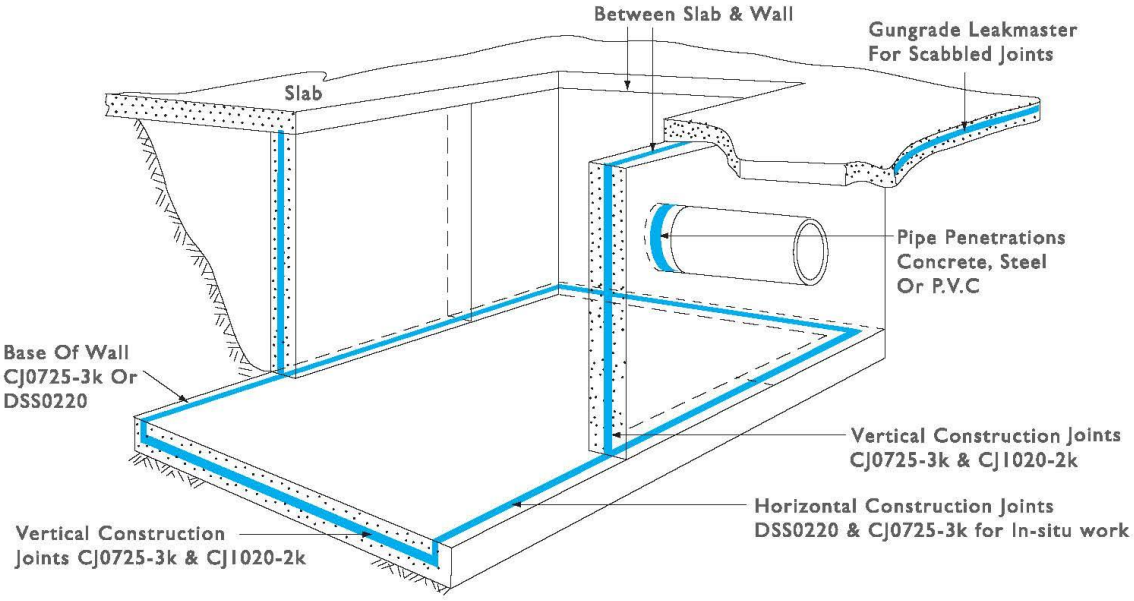
AREAS OF APPLICATION

Hydrotite is to be used where watertight integrity is the prime issue. Typical applications where there is a need to achieve a water seal include:-

- Sewerage Treatment Plants
- Water Treatment Plants
- Reservoirs
- Pipe Penetrations
- Swimming Pools
- Tunnels
- Subway Stations
- Basements
- Pits



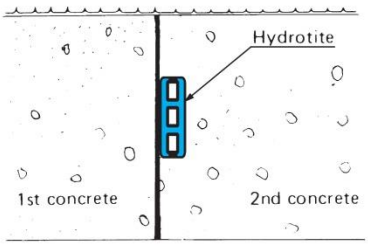
PROFILE SELECTION

Shown below is a guideline of where Hydrotite profiles have been specified and used in construction joints in various projects. (Refer separate project list).

Joint details should be verified by the Consulting Engineer who should satisfy himself of the suitability of the product for its intended use.

- VERTICAL CONSTRUCTION JOINTS
  CJ0725-3K, CJ1020-2K, CJ1030-4M, CJ2020-M
- HORIZONTAL CONSTRUCTION JOINTS
  DSS0220, CJ0725-3K, CJ1020-2K, LEAKMASTER
- JOINT AND LEAK REPAIRS
  RSS RODS VARIOUS SIZES
- PIPE PENETRATIONS
  DSS0220, CJ0725-3K, LEAKMASTER
- THRU TIE HOLES
  RSS RODS, RSS2519D, RSS2014D

Typical Application of Hydrotite



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PHYSICAL PROPERTIES

ITEM	UNIT	HYDROPHILIC RUBBER		CHLOROPRENE RUBBER		TEST METHOD
		Specification	Typical	Specification	Typical	
Hardness		A50 ± 5	A53	A50 ± 5	A54	JIS K 6253
Tensile Strength	MPa	Min. 2.5	2.9	Min. 8.8	10.1	JIS K 6251
Elongation	%	Min. 600	700	Min. 400	530	JIS K 6251

WRITTEN SPECIFICATION

Hydrophilic expanding waterstops shall be placed at the joints in the concrete at the locations shown on the drawings in accordance with the requirement of this specification. Waterstops where shown on drawings shall be Hydrotite (fill in profile number) Hydrophilic Waterstops as supplied by CORKJOINT.

The waterstop shall consist of a non-expansive black chloroprene rubber, co-extruded with a blue hydrophilic rubber, which is capable of swelling by approximately eight times by volume. The waterstop shall be treated with a delay coating to prevent premature expansion and be able to change colour upon expansion which acts as a visual alert that the waterstop has started to expand. The waterstop is to be installed strictly in accordance with the manufacturers recommendations.

LEAKMASTER

Leakmaster is a water swelling gun grade waterstop with excellent and unique physical properties. It can be used in places where the standard extruded profiles are not suitable in areas such as rough concrete surfaces or as a back-up to these profiles in complex junctions. (Please refer to separate Leakmaster brochure).

PACKAGING

PROFILE	DIMENSIONS	METRES PER ROLL	METRES PER CARTON
DSS0220*	20mm x 2mm	25	100
CJ0725-3K*	25mm x 7mm	10	40
CJ1020-2K*	20mm x 10mm	10	50
CJ1030-4M	30mm x 10mm	10	40
CJ2020-M	20mm x 20mm	10	30
RSS1208D	12mm diameter	20	40
RSS1610D	16mm diameter	10	20
RSS2014D	20mm diameter	10	20
RSS2519D	25mm diameter	5	10

* These profiles are also available with self-adhesive backing (upon request).

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CHEMICAL RESISTANCE

The influence of pH values of concrete, grouting material and ground water upon the expansion of Hydrotite was tested using hydrophilic rubber as follows. The specimen was immersed in each solution for seven days and the retention value of tensile strength and elongation were measured. Then, the specimen was removed from each solution and placed in tap water for seven days. The specimen was then compared with specimens that had been expanded in tap water only.

The retention value of both physical properties and expansion was compared with that of specimens tested in tap water. Hydrotite keeps the retention values 90% or more in all solutions listed in Table 2. In the Table 2, ○ indicates retention value 90% or more.

TYPE OF TEST SOLUTION	CHANGE OF PHYSICAL PROPERTIES AFTER 7 DAYS IMMERSION		RETENTION OF EXPANSION VALUE AFTER 7 DAYS IMMERSION IN TAP WATER FOLLOWING IMMERSION IN SOLUTION
	TENSILE STRENGTH	ELONGATION	
pH 3 aqueous solution	○	○	○
pH 5 aqueous solution	○	○	○
pH 7 (tap water)	—	—	—
pH 9 aqueous solution	○	○	○
pH 11 aqueous solution	○	○	○
Ferrous aqueous solution	○	○	○
Bentonite aqueous solution	○	○	○
Grout aqueous solution	○	○	○

INSTALLATION PROCEDURES, MSDS AND HEALTH & SAFETY

For further information or advice on installation procedures, health & safety precautions, safe handling storage and correct disposal of products, please refer to the most recent product installation procedures and Material Safety Data Sheet (MSDS), which are available upon request.

Effective Date: 01 January 2014

CORKJOINT (MALAYSIA) SDN BHD 383102-H
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CORKJOINT (SINGAPORE) PTE LTD 200716724-K
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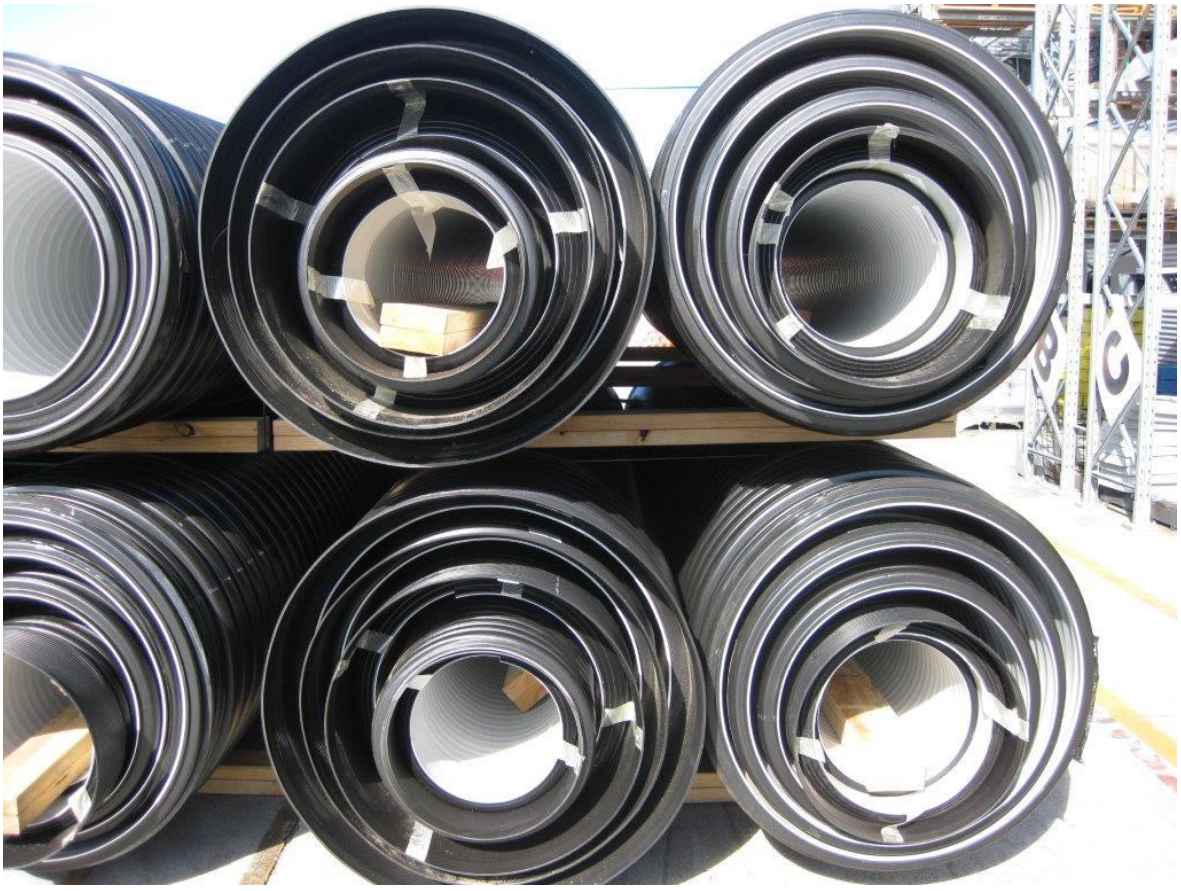
APPENDIX G – PACKAGING AND TRANSPORTATION



APPENDIX H – VINIDEX TERMS AND CONDITIONS OF SALE

VINIDEX PTY LTD: STANDARD TERMS AND CONDITIONS OF SALE

1. Interpretation

In these conditions:

(i) "Vinidex" shall mean "Vinidex Pty Limited";

(ii) the word "person" shall be deemed to include a corporation, words importing the singular or plural number shall be deemed to include the plural or singular number respectively and words importing the masculine gender only shall include the feminine or neuter gender as the case may require;

(iii) "Goods" shall mean Goods agreed to be supplied or supplied by Vinidex to the Buyer;

(iv) "Buyer" shall mean a person who purchases the Goods or a person to whom a quotation for supply of the Goods is submitted.

2. Quotations

All quotations for the supply of Goods, however made, are not offers and are provided only as indicative statements of current price levels.

3. Prices

Except where a fixed price or a price fluctuation formula is stated in a form of acceptance of order, all prices are subject to change by Vinidex without notice and shall be those ruling at the date of dispatch. Where a firm price is stated in the form of acceptance of order then, unless otherwise stated, the price therein shall rule for thirty (30) days from the date of the acceptance and, thereafter, Vinidex reserves the right to vary the price as it determines at any time prior to delivery of the Goods pursuant to Clause 9. All quoted and list prices are ex-GST which shall be included at time of sale.

4. Acceptance of Orders

Orders for Goods shall only be deemed to have been accepted by Vinidex if:-

(i) accepted in writing by Vinidex; or

(ii) delivery of the Goods in accordance with Clause 9 hereof is made to the Buyer.

5. Terms of Payment

Unless otherwise stated in Vinidex's acceptance of order, Terms of Payment for Goods are cash at the time the order is placed and, where credit is not given to the Buyer, payment shall be made at the time that the order is placed. All payments shall be made in Australian currency. Where Vinidex has agreed to give the Buyer credit, payment shall, unless otherwise stated in its acceptance or order, be made by the Buyer within thirty (30 days of the date of delivery of the Goods. Vinidex may at any time without notice withdraw any credit facility and require payment upon an order being placed. All approvals to the granting of credit shall be in writing signed by a Director of Vinidex or their duly authorised representative and, unless approved in such manner, credit shall not be deemed to have been given to a Buyer for the purposes hereof.

If a payment due by the Buyer is not made within thirty (30) days of the date due for payment, Vinidex shall without further notice to the Buyer be entitled to charge interest on the monies so due on and from the expiration of the thirty (30) day as aforesaid at the rate of 12% per annum. Time is of the essence so far as payment of monies owing by the Buyer to Vinidex is concerned.

6. Until Vinidex has been paid in full for Goods supplied by it to the Buyer:

(a) Vinidex remains the owner of those Goods and the Buyer is only a bailee;

(b) Buyer must store the Goods separately from any other Goods, keep them readily identifiable as Vinidex's Goods and maintain proper records of any sale or disposal of the Goods;

(c) Buyer bears all risk in respect of the Goods from delivery and must fully insure them;

(d) Buyer will not sell the Goods except in the ordinary course of business;

(e) Buyer will hold the proceeds of any sale or disposal of the Goods to the extent of the amount due to Vinidex in a separate account for Vinidex's benefit and promptly pay that amount to Vinidex; and

(f) Vinidex shall take a security interest in the Goods to the extent that it secures all and any unpaid purchase price (a "purchase money security interest") and register its purchase money security interest pursuant to the Personal Property Securities Act, 2009.

7. At all times Buyer will allow Vinidex access to the premises occupied by Buyer during normal business hours and to the Goods in order to inspect the Goods and retake possession of the Goods at any time prior to payment in full of the price payable for the Goods supplied by Vinidex to the Buyer and for other monies payable by the Buyer to Vinidex on any other account whatsoever. Buyer acknowledges that this access shall be full, free and unhindered and shall not be or constitute trespass by Vinidex, its servants or agents. Buyer indemnifies and agrees to keep indemnified Vinidex for any liability or loss it suffers in seeking to exercise its said rights of access and retaking possession of the Goods.

8. Title and Risk

Unless otherwise stated in the form of acceptance of order, the Goods shall remain the property of Vinidex until the purchase price has been paid in full to Vinidex, provided that the risk of the Goods shall pass to the Buyer upon the delivery to the Buyer in accordance with Clause 9 hereof.

9. Delivery and Receipt of the Goods

Delivery of the Goods to the Buyer or to such person (including a carrier) or destination nominated by the Buyer and agreed by Vinidex shall constitute both delivery to and receipt of the Goods by the Buyer. Unless otherwise stated in Vinidex's acceptance of order the Buyer shall arrange and pay for the cost of the transportation of the Goods and shall pay the cost of all charges necessarily incidental to the transportation of the Goods, including but without limiting the generality of the preceding, insurance in respect of the Goods.

10. Defects and Delivery Date

In the event that the Goods or any of them or any parts thereof have defects or have been damaged, or, in the event that there are shortages in number, then the Buyer shall, within seven (7) days of the date of delivery, time being of the essence, notify Vinidex of the same in writing giving full particulars to the claim. Thereafter, Vinidex shall investigate the Buyer's claim and in the event that Vinidex reasonably determines that the defects damage or shortages as the case may be were in existence prior to delivery to the Buyer then Vinidex shall, at no charge to the Buyer, replace the Goods in question or otherwise remedy the defect or damage or makeup for the shortages as the case may be.

Vinidex shall endeavour to meet delivery dates (if any) specified by the Buyer but shall not be liable for any loss, damage or harm of any nature whatsoever suffered by the Buyer or any other person arising directly or indirectly from delivery of the Goods not being effected by any delivery date specified as aforesaid.

11. Statutory Warranty and Limitation of Liability

(a) Warranties that may be implied by the Competition and Consumer Act, 2010, or any other legislation applicable to the Goods are hereby expressly excluded to the extent that such exclusion is not prohibited by such legislation.

(b) Vinidex's liability to the Buyer for any breach of its obligations hereunder in relation to delivery of the Goods, defective Goods, damaged Goods referred to in Clause 10, or any warranty implied by law (other than a warranty as to title) shall in all cases be limited to an amount equal to the lesser of (as determined by Vinidex);
   (i) the cost of having the Goods repaired; or
   (ii) the cost of replacing the Goods; or
   (iii) the cost of obtaining and supplying equivalent goods.

(c) Notwithstanding any other provision of these terms and conditions and any additional terms to which Vinidex and the Buyer have agreed apply to a supply of Goods, Vinidex shall not be liabile;
   (i) for special, indirect or consequential loss or damage whatsoever in connection with the supply and use of the Goods, including but not limited to any loss of revenue or profits which would otherwise be derived from the use of the Goods; or
   (ii) in tort including any tortious act, neglect or default of Vinidex, its servants or agents, in connection with the supply, delivery and use of the Goods.

12. Special Orders

Goods manufactured to drawings and/or specifications and/or designs provided by or on behalf of the Buyer are not returnable to Vinidex under any circumstances and the Buyer agrees to indemnify and to keep indemnified Vinidex from and against all costs, losses and damages claimed in relation to any design defect in such Goods and any third party claim that the Goods as manufactured infringe any patent, registered design, copyright or common law intellectual property right of any person.

13. Assignment by Buyer

The Buyer shall not assign or purport to assign its rights and obligations herein to any third party without the prior consent in writing of Vinidex.

14. Force Majeure

No failure or omission to carry out or observe any of the conditions of this contract shall give rise to any claim against Vinidex or result in a breach of this contract if such failure or omission arises by reason of delay or inability to obtain materials, fire, storm or other action of the elements, accidents, government restrictions or from other causes whether like or unlike the foregoing which are unavoidable or otherwise beyond the control of Vinidex.

15. Waiver

Failure by Vinidex to insist upon the performance of any one or more of the conditions hereof shall not be deemed to be a waiver of any rights and remedies that Vinidex may have and shall not be deemed a waiver of any subsequent breach or default. No provision of this contract shall be deemed to have been waived by Vinidex unless such waiver shall be in writing and signed by an officer of Vinidex giving notice in that behalf.

16. Notices

Any notice required to be given under this contract shall if the party is a Company, be signed by any person being or purporting to be a Director, Manager, Secretary or other officer of the party giving it, and if not a Company then by the party himself and shall be deemed to have been given on the second day following posting if sent by pre-paid mail in an envelope addressed to the registered office or principle place of business or last known address as the case may be of the party to whom the notice is being sent.

17. Terms and Variation

(a) These terms and conditions and any other terms and conditions for supply of the Goods to which Vinidex has consented to in writing are the sole terms and conditions governing the sale and supply of the Goods by Vinidex to the Buyer.

(b) The terms and conditions referred to in Clause 17(a) above may only be varied, modified, amended or added to with the consent in writing of Vinidex.

18. Disputes

(a) If any dispute arises in relation to Goods supplied by Vinidex to the Buyer, Vinidex may by notice in writing to the Buyer at any time prior to determination by a court require that such dispute or part thereof be determined by arbitration according to law. The arbitration is to be conducted in accordance with the relevant Commercial Arbitration Act (of whatever name) of the State or Territory nominated as being the governing law and in the capital city of that State or Territory. Vinidex may give notice that any dispute with the Buyer is arbitrated with any other dispute relating to the same Goods or issues. There is to be a single arbitrator appointed by agreement or failing agreement by the president of the law society of that State or Territory. The arbitrator's decision is final and binding subject to any right of appeal under the relevant Commercial Arbitration Act.

. (b) The reference of a dispute to arbitration does not affect the Buyer's obligation to pay the price for the Goods when due which must be paid without deduction or equitable or other set off pending the resolution of any dispute whether referred to arbitration or otherwise.

19. Proper Law

These terms will be governed by and construed in accordance with the laws of a State or Territory of Australia as the Company directs and the customer irrevocably submits to the exclusive jurisdiction of a competent court in the capital city of that State or Territory.

20. Severability

If any of these terms are or alter become illegal or unenforceable, the illegal or unenforceable part of those terms are taken to be severed from these terms, but all other terms remain in place.

21. Acquisition for Re-supply

The Buyer warrants that he is acquiring the Goods for the purpose of re-supply or for the purpose of using them up or transforming them in trade or commerce in the course of a process of production or manufacture or of repairing or treating other goods or fixtures on land and the parties agree that unless otherwise specified in writing the Goods are of a kind not ordinarily acquired by the Buyer for personal, domestic or household use or consumption.

APPENDIX I – TYPE AND PERFORMANCE TEST RESULTS

The test results are based on Table A1 of AS/NZS5065:2005 detailing how compliance with each clause in this table can be demonstrated.

- Test results presented in Table H1 and H2 have been submitted by Vinidex

The type test results are satisfactory which includes the additional type testing necessary for the change of joint design for the StormPRO® and SewerPRO® range of pipe and fittings. New design joints can be identified by PRO2 marking.

- **Table I-1** – Results of the type tests conducted for obtaining original product certification to AS/NZS 5065 (i.e. WMKA21671) and renewal of licence WMKA/SMKP20687.
- **Table I-2** – Results of the batch release tests conducted for obtaining original product certification to AS/NZS 5065 (i.e. WMKA21671) and renewal of licence WMKA/SMKP20687.
- **Table I-3** - Results of the Re-type tests relevant to the new joint design of StormPRO® and SewerPRO® (named as PRO2) conducted in between 15 July to 1 October 2014 using Hultec elastomeric seals.

NOTE: All the above tests have been conducted by SAI Global at Vinidex's NATA accredited laboratory (Accreditation No. 2640).

Table I-1: Results of the type tests conducted for obtaining original product certification to AS/NZS 5065 (i.e. WMKA21671) and renewal of licence WMKA/SMKP20687

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
TYPE TESTS (TT)						
Material Property	2.1.3	Mass of carbon black	ISO 6964	Any new material formulation or design, or once every 5 years, whichever occurs first	Only Grey compound is used for SewerPRO® fittings manufacture. This clause is only applicable to black PE and PP compounds. Note: This clause only applies to the outer black skin of StormPRO® pipe. Supplier datasheet for Novocolour BKPP1062 and ABOM screen dumps test results confirmed carbon black content of 2 to 2.1%.	**This clause is not relevant to PP.**
	2.1.3	Particle size of carbon black	ASTM D3849			
	2.1.3	Toluene extract of carbon black	AS/NZS 4131 Appendix B			
	2.1.4	Volatile content	ISO 4437 Annex A		This methodology is employed for black compounds that are hygroscopic. Vinidex use natural (non-black) compound to which masterbatch is added. Both compound and masterbatch are pre-dried prior to being used to manufacture pipe. This clause is irrelevant as there is little point testing a natural compound.	**This clause is not relevant to PP.**
	2.1.5	Melt mass-flow rate	ISO 1133 Condition 12		This has been successfully demonstrated by Borouge BorECO BA212E Product Data Sheet and SP test report F325787A for BA212E material dated 8-3-2004.	**Complies**
	2.1.6	Thermal stability of PE compounds	ISO 11357-6		Not applicable as the products are PP	**This clause is not relevant to PP.**
	2.1.7	Environmental Stress Cracking Resist (ESCR) of PE compounds	AS/NZS 1462.25		Not applicable as the products are PP	**This clause is not relevant to PP.**
	2.1.8	Tensile properties of PE compounds	AS 1145.2		Not applicable as the products are PP	**This clause is not relevant to PP.**

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
TYPE TESTS (TT)						
Material Property	2.1.9	Internal pressure resistance of PP	ISO 8773	Any new material formulation or design, or once every 5 years, whichever occurs first	This requirement has been demonstrated through SP test report F325787A for BA212E material dated 8-3-2004. As this test was based on ISO1167:1976, SAI Global (Vinidex's Third Party Auditor) provided correlation to demonstrate that test results comply with ISO 8773. ISO1167 is the pressure test method required by ISO 8773. The pressure test results demonstrate compliance with ISO 8773. I.e. Greater than 1000 hrs @95 Deg.C @2.5MPa Hoop Stress.	**Complies**
	2.1.10	Decohesive resistance of jacketed and striped pipe	ISO 13954		Not applicable - Jackets and stripes are not used for StormPRO® and SewerPRO® pipes.	**This clause is not relevant to PP.**
	2.2	Weathering resistance	AS/NZS 4131 Appendix C		Nuplex Dark Grey ZG152 technical data sheet indicating masterbatch composition and ABOM dumps indicating addition rates.	**Complies**
	2.3	Elastomeric seals	AS 1646		All seals are supplied by Hultec and manufactured under ApprovalMark license AMI 74510 to AS 1646.	**Complies**
Performance	3.1	Thermal stability of pipes and fittings	ISO/TR 10837		Not applicable - products are PP	**This clause is not relevant to PP.**
	3.2.1	Reversion of pipes	AS/NZS 1462.4		Reversion test in only required for pipes with plain wall, not StormPRO and SewerPRO PP pipes.	**Complies**

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
TYPE TESTS (TT)						
Performance	3.2.2	Stiffness of pipes	AS/NZS 1462.22	Any new material formulation or design, or once every 5 years, whichever occurs first	Screen dumps from ABOM recording compliance for these tests have been submitted. (Ring Flexibility is superfluous with these PP pipes, as they pass easily) SAI Global provided copies of previous certification test reports for these tests. Vinidex has confirmed there have been no changes to materials and pipe designs since previous testing. Vinidex has submitted ABOM screen dumps for a number of diameters for both StormPRO and SewerPRO® that contain stiffness results. (Wagga ABOM QC Results.xls) Note: StormPRO® is SN8, SewerPRO is SN10. Vinidex has also submitted tests conducted at CSIRO for ring flexibility and stiffness on samples of DN150 StormPRO® & DN900 SewerPRO®. (5 files: 2202_010.pdf; 2202_011.pdf; 2202_012.pdf, 2202_013.pdf; 2202_014.pdf)	**Complies**
	3.3.3	Cohesive resistance of electrofusion sockets	ISO 13954, ISO 13955		There have been no changes since the original fitting in SAI Global licence was certified. Vinidex has also submitted previous test reports. Marking was approved at a later date, which is also attached:(02_DN150_ PRO_Coupling.pdf; DN150 PRO Coupling Marking Label.jpg)	**Complies**

<table>
<tr><th>Characteristics</th><th>Clause</th><th>Requirement</th><th>Test Method</th><th>Frequency</th><th>Test Results</th><th>Remarks</th></tr>
<tr><td colspan="7">TYPE TESTS (TT)</td></tr>
<tr><td rowspan="3">Performance</td><td>3.4.1</td><td>Hydrostatic pressure resistance of elastomeric seal joints</td><td>AS/NZS 1462.8</td><td rowspan="3">Any new material formulation or design, or once every 5 years, whichever occurs first</td><td rowspan="3">Vinidex has submitted NATA endorsed test reports 1016A, 1017 and 1018 dated 21/09/2010
Recent NATA Endorsed test reports are available to present a full set of joint tests for DN225, DN525 & DN900 that were conducted between 2010 & 2011.
The test results are presented in NATA endorsed reports (9 files: 1013.pdf; 1014.pdf; 1015.pdf; dated 17/08/2010 and 1016A.pdf; 1017.pdf; 1018.pdf; dated 21/09/2010 and 1022.pdf; 1023.pdf; 1024.pdf dated 1/4/2011)

This appraisal has also witnessed type tests conducted on a DN150 SewerPRO® coupling report no. 1006 dated 6/4/2009 for Clause 3.4.1 and report no. 1007 dated 6/4/2009 for Clause 3.4.2.

All the above test reports are treated as “Commercial-in-Confidence” To request access to these document refer to Vinidex.</td><td rowspan="3">These reports cover the full range of elastomeric seal tests for DN225 joints. They were submitted as part of CR22598.

The following table summarises the corresponding dimensions for the pipe and fitting sockets showing that the fittings have a narrower range within the specification range of the pipe socket internal diameter.

<table><tr><th></th><th colspan="2">ID (mm)</th></tr><tr><th></th><th>Min</th><th>Max</th></tr><tr><td>DN150 pipe socket</td><td>171.6</td><td>172.4</td></tr><tr><td>DN150 fittings socket</td><td>172.00</td><td>172.40</td></tr><tr><td>DN225 pipe socket</td><td>263.4</td><td>264.6</td></tr><tr><td>DN225 fittings socket</td><td>264.00</td><td>264.60</td></tr></table>
Complies</td></tr>
<tr><td>3.4.2</td><td>Liquid infiltration of elastomeric seal joints</td><td>AS/NZS 1462.8</td></tr>
<tr><td>3.4.3</td><td>Contact width and pressure of elastomeric seals</td><td>AS/NZS 1462.13</td></tr>
</table>

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
TYPE TESTS (TT)						
Dimensions	4.1.3.4, **4.1.4.4,** 4.1.4.7	Pipe spigot and socket ring stiffness **Dimensions of sockets & spigots ID series**	ISO 9969	Any new design	These dimensions are essentially joint design measurements. Vinidex has successfully demonstrated compliance to this requirement through previous tests used to gain original SAI Global StandardsMark certification. The test results are shown in Files: 2202_006.pdf; 2202_022.pdf; 2202_023.pdf; and 2202_024.pdf The joint stiffness requirement in this clause is essentially a given for DN150 to DN600; the pipe spigot by itself meets this requirement, without the additional stiffness provided by the socket. The DN750 & DN900 have a different joint design (which hasn't changed since the original certification). Vinidex provided a copy of CSIRO test report from initial product certification (WMKA/SMKP20687) for joint stiffness of DN900 SewerPRO ref. 2910R2 Determination DN900 Joint Stiffness Vindex.pdf.	**Complies**

Table I-2 – Results of the batch release tests conducted for obtaining original product certification to AS/NZS 5065 (i.e. WMKA21671) and renewal of licence WMKA/SMKP20687

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
BATCH RELEASE TESTS (BRT)						
Performance	3.2.1	Reversion of pipes	AS/NZS 1462.4	Once per batch	Reversion test in only required for pipes with plain wall, not StormPRO® and SewerPRO® PP pipes.	**This clause is not relevant to PP.**
Dimensions	4.1	Dimensions of pipes	AS/NZS 1462.1*	Once per hour or start of coil, whichever is the greatest	Clause 4.1.4.2 Dimensions – ID Series: Min. Mean = 155.3 mm for a DN150 SewerPRO® coupling. Criterion ≥ 143.6	**Complies** (Vinidex report no. 1008 dated 6/4/2009)

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
BATCH RELEASE TESTS (BRT)						
Dimensions	4.2	Effective length of pipes	AS/NZS 1462.1	Once per 4 h	Manufacturer's nominated effective length - ABOM Product 29411 DN 150 - Vinidex Product Specification 29411 printed 3 September 2007[W] DN 600 - Vinidex Product Specification 29426 printed 24 September 2007[**F**] DN 900 - Vinidex Product Specification 29428 printed 3 June 2008[**F**]	**Complies** • VDX NATA Test report PP_20070827_05[V] • VDX NATA Test report PP_20070917_03[**E**] • VDX NATA Test report PP_20080602_03[**E**]
	4.3	Spigot ends of pipe	Visual inspection		Nominally square DN 150 DN 600 DN 900	**Complies** • VDX NATA Test report PP_20070827_05[V] • VDX NATA Test report PP_20070917_03[**E**] • VDX NATA Test report PP_20080602_03[**E**]
	4.4	Stripes on pipes	Clause 4.4	Once per 4 h	This test is not applicable as StormPRO® and SewerPRO® do not have stripes	**This clause is not relevant to PP.**
	4.5	Sockets formed on pipe ends - *Parallelism of sockets to pipe axis*	Clause 4.5	Once per 4 h	Parallel to within 2 degrees	**Complies** • DN 150: VDX NATA Test report PP_20070827_05[V] • DN 600: VDX NATA Test report PP_20070917_03[**E**] • DN 900: VDX NATA Test report PP_20080602_03[**E**]
		Sockets formed on pipe ends - *Concentricity of sockets to pipe axis*	Clause 4.5		Socket to be concentric with pipe mean diameter within 2.5% up to DN160 and 1% above DN160.	

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
BATCH RELEASE TESTS (BRT)						
Dimensions	5.2	Dimensions of fittings	AS/NZS 1462.1*		Sample DN150 SewerPRO® coupling a) 5.2.1 Wall thickness – Min = 3.3 mm, Criterion Min ≥ 1.3 mm b) 5.2.3 Sockets on moulded fittings – Socket is visually parallel, Criterion Visual inspection. c) 5.2.4 Socket wall thickness – Min = 3.3 mm, Criterion Min ≥ 2.0 mm d) 5.2.5 Inside diameter – Min Mean = 170.9 mm, Criterion Mean ≥ 169.4 mm	**Complies** (Vinidex report no. 1008 dated 6/4/2009)
Freedom from defects	4.6, 5.3	Freedom from defects	Clause 4.6		There are no visible defects that would affect the performance or function of the fitting in service. There are no defects present that exceed the dimensional requirements of AS/NZS 5065.	**Complies** (Vinidex report no. 1008 dated 6/4/2009)
Marking	4.7, 4.8, 5.4	Marking and witness mark *Minimum letter height 5 mm, no more than 1 m between marks, legible, information as per clause 4.7*	Visual inspection		• Manufacturer's name (Vinidex) • Nominal size (150) • Product bar code (Class) • Product code (PP) • Product description (date or batch)	**Complies** • DN 150 - VDX NATA Test report PP_20070827_05[V] • DN 600 - VDX NATA Test report PP_20070917_03[**E**] • DN 900 - VDX NATA Test report PP_20080602_03[**E**]

* May also be tested by attributes (e.g., no and no-go gauges).

Table I-3 - Results of the Re-type tests relevant to the new joint design of StormPRO and SewerPRO (named as PRO2) conducted in between 15 July to 1 October 2014 using Hultec elastomeric seals

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
RE-TYPE TESTS (TT) – DN 300 StormPRO® socket + pipe spigot + off tool sample from Hultec for the seal						
Performance	3.4.1	Hydrostatic pressure resistance of elastomeric seal joints	AS/NZS 1462.8	Any new material formulation or design, or once every 5 years, whichever occurs first	After the application of a diametral distortion of 28 mm (8.2%) and no angular deflection the specimen was subjected to an internal pressure of between 80 and 85 kPa for 1 hour and four minutes without any sign of leakage at the joint. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.8:2008 meets the requirements of Clause 3.4.1 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1075 dated 16/7/2014)
	3.4.2	Liquid infiltration of elastomeric seal joints	AS/NZS 1462.8		After the application of a diametral distortion of 28 mm (8.2%) and no angular deflection the specimen was subjected to an internal pressure of between -80 and -85 kPa for 1 hour and five minutes without any sign of leakage at the joint. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.8:2008 meets the requirements of Clause 3.4.2 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1076 dated 16/7/2014)
	3.4.3	Contact width and pressure of elastomeric seals	AS/NZS 1462.13		The continuous length of contact between the seal and the socket for which the leak onset pressure exceeded 400 kPa was 7.3 mm. The requirement is to exceed 400 kPa for at least 4 mm. Therefore, the result is a pass. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.13:2006 meets the requirements of Clause 3.4.3 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1074 dated 15/7/2014)
Dimensions	4.1.3.4, **4.1.4.4,** 4.1.4.7	Pipe spigot and socket ring stiffness **Dimensions of sockets & spigots ID series**	ISO 9969	Any new design	Tests were conducted in accordance with AS/NZS 1462.1:2006 *Methods of test for plastics pipes and fittings Method 1: Method for determining the dimensions of pipes and fittings* • Sealing length "A" – criterion A $\geq$ 62 mm; actual value 94 mm – Pass • Socket ID – criterion Di $\geq$ 343.75 mm; actual value 347.03 mm – Pass The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.1:2006 meets the dimensional requirements of Clause 4.1.4.4 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1077 dated 16/7/2014)

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
RE-TYPE TESTS (TT) – DN 375 StormPRO® socket + pipe spigot + off tool sample from Hultec for the seal						
Performance	3.4.1	Hydrostatic pressure resistance of elastomeric seal joints	AS/NZS 1462.8	Any new material formulation or design, or once every 5 years, whichever occurs first	After the application of a diametral distortion of 8.2% and no angular deflection the specimen was subjected to an internal pressure of between 80 and 85 kPa for 1 hour and four minutes without any sign of leakage at the joint. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.8:2008 meets the requirements of Clause 3.4.1 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1079 dated 6/8/2014)
	3.4.2	Liquid infiltration of elastomeric seal joints	AS/NZS 1462.8		After the application of a diametral distortion of 8.2% and no angular deflection the specimen was subjected to an internal pressure of between -80 and -85 kPa for 1 hour and five minutes without any sign of leakage at the joint. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.8:2008 meets the requirements of Clause 3.4.2 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1080 dated 7/8/2014)
	3.4.3	Contact width and pressure of elastomeric seals	AS/NZS 1462.13		The continuous length of contact between the seal and the socket for which the leak onset pressure exceeded 400 kPa was 7.4 mm. The requirement is to exceed 400 kPa for at least 4 mm. Therefore, the result is a pass. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.13:2006 meets the requirements of Clause 3.4.3 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1078 dated 5/8/2014)
Dimensions	4.1.3.4, **4.1.4.4,** 4.1.4.7	Pipe spigot and socket ring stiffness **Dimensions of sockets & spigots ID series**	ISO 9969	Any new design	Tests were conducted in accordance with AS/NZS 1462.1:2006 *Methods of test for plastics pipes and fittings Method 1: Method for determining the dimensions of pipes and fittings* • Sealing length "A" – criterion A $\geq$ 64 mm; actual value 118 mm – Pass • Socket ID – criterion Di $\geq$ 429.0 mm; actual value 431.7 mm – Pass • Socket OOR – criterion Not specified; actual value 3.1 mm – N/A • Spigot OD – criterion Dm $\leq$ 429.0 mm (manuf. Spec.); actual value 427.8 mm – Pass • Spigot OOR - criterion Not specified; actual value 2.4 mm – N/A The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.1:2006 meets the dimensional requirements of Clause 4.1.4.4 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1079 dated 6/8/2014 and 1080 dated 7/8/2014)

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
RE-TYPE TESTS (TT) – DN 450 StormPRO® socket + pipe spigot + Seal supplied with the pipe						
Performance	3.4.1	Hydrostatic pressure resistance of elastomeric seal joints	AS/NZS 1462.8	Any new material formulation or design, or once every 5 years, whichever occurs first	**Description of the test**: The joint is assembled and then distorted by squashing the spigot between steel bars. The distortion is maintained while the assembly is subjected to a hydrostatic pressure test. **Test results**: 7.5% diametral distortion, 80 to 85 kPa for a minimum of 1 hour with no leakage. After the application of a diametral distortion of 8.2% and no angular deflection the specimen was subjected to an internal pressure of between 80 and 85 kPa for 1 hour and three minutes without any sign of leakage at the joint. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.8:2008 meets the requirements of Clause 3.4.1 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1084 dated 1/10/2014)
	3.4.2	Liquid infiltration of elastomeric seal joints	AS/NZS 1462.8		**Description of the test**: The joint is assembled and then distorted by squashing the spigot between steel bars. The distortion is maintained while the assembly is subjected to a negative pressure test. **Test results**: 7.5% diametral distortion, -80 to -85 kPa for a minimum of 1 hour with no leakage. After the application of a diametral distortion of 8.2% and no angular deflection the specimen was subjected to an internal pressure of between -80 and -85 kPa for 1 hour and three minutes without any sign of leakage at the joint. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.8:2008 meets the requirements of Clause 3.4.2 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1085 dated 1/10/2014)
	3.4.3	Contact width and pressure of elastomeric seals	AS/NZS 1462.13		The continuous length of contact between the seal and the socket for which the leak onset pressure exceeded 400 kPa was 6.0 mm. The requirement is to exceed 400 kPa for at least 4 mm. Therefore, the result is a pass. The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.13:2006 meets the requirements of Clause 3.4.3 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1078 dated 5/8/2014)

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
RE-TYPE TESTS (TT) – DN 450 StormPRO® socket + pipe spigot + Seal supplied with the pipe						
Dimensions	4.1.3.4, **4.1.4.4,** 4.1.4.7	Pipe spigot and socket ring stiffness **Dimensions of sockets & spigots ID series**	ISO 9969	Any new design	**Description of the test**: A small hole is made in the socket near the position of the seal when fully assembled. The spigot is inserted into the socket and the pressure required to just commence leaking is measured at small intervals as the seal is passed over the hole. Tests were conducted in accordance with AS/NZS 1462.1:2006 *Methods of test for plastics pipes and fittings Method 1: Method for determining the dimensions of pipes and fittings* • Sealing length "A" – criterion A ≥ 70 mm; actual value 117 mm – Pass • Socket ID – criterion Di ≥ 515.15 mm; actual value 521.3 mm – Pass • Socket OOR – criterion Not specified; actual value 2.2 mm – N/A • Spigot OD – criterion Dm ≤ 515.15 mm (manuf. Spec.); actual value 514.15 mm – Pass • Spigot OOR - criterion Not specified; actual value 2.0 mm – N/A The elastomeric seal joint described above, when tested in accordance with AS/NZS 1462.1:2006 meets the dimensional requirements of Clause 4.1.4.4 of AS/NZS 5065:2005 (Incorporating Amendment 1).	**Complies** (Vinidex report no. 1084 and 1085 dated 1/10/2014)

Characteristics	Clause	Requirement	Test Method	Frequency	Test Results	Remarks
RE-BATCH RELEASE TESTS (BRT) – conducted on various sizes of SewerPRO® and StormPRO® PP pipes						
Dimensions	4.2	Effective length of pipes	AS/NZS 1462.1	Once per 4 hour	Vinidex submitted 14 Excel sheets for BRTs conducted on various sizes of StormPRO and SewerPRO pipes (from 150mm to 900mm) for lengths 3m and 6m between 12/01/2015 to 15/06/2015. Most of these BRTs for Effective length of pipes had satisfactory results.	**Complies**
	4.5	Sockets formed on pipe ends	Clause 4.5		• Vinidex Report No. PP_20070827_05 for DN150 StormPRO; • Report No. PP_20070917_03 for DN600 SewerPRO; and • Report No. PP_20080602_03 submitted to demonstrate this requirement.	**Complies**

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