contents

Vinidex
Systems & Solutions

Limitation of Liability

This manual has been compiled by Vinidex Pty Limited ("the Company") to promote better understanding of the technical aspects of the Company's products to assist users in obtaining from them the best possible performance.

The manual is supplied subject to acknowledgement of the following conditions:

- The manual is protected by Copyright and may not be copied or reproduced in any form or by any means in whole or in part without prior consent in writing by the Company.
- Product specifications, usage data and advisory information may change from time to time with advances in research and field experience. The Company reserves the right to make such changes at any time without notice.
- Correct usage of the Company's products involves engineering judgements which cannot be properly made without full knowledge of all the conditions pertaining to each specific installation. The Company expressly disclaims all and any liability to any person whether supplied with this publication or not in respect of anything and of the consequences of anything done or omitted to be done by any such person in reliance whether whole or partial upon the whole or any part of the contents of this publication.
- No offer to trade, nor any conditions of trading, are expressed or implied by the issue of content of this manual. Nothing herein shall override the Company's Conditions of Sale, which may be obtained from the Registered Office or any Sales Office of the Company.
- This manual is and shall remain the property of the Company, and shall be surrendered on demand to the Company.
- Information supplied in this manual does not override a job specification, where such conflict arises, consult the authority supervising the job.

© Copyright Vinidex Pty Limited
ABN 42 000 664 942

Vinidex
Systems & Solutions

Handling & Storage

Vinidex PE pipes are available in a range of sizes ranging from 16mm to 1000mm in configurations complying with AS/NZS4130. Pipes may be supplied to customer requirements in either small diameter pipe in coil lengths up to 9500m, or in straight lengths up to 25m.

Vinidex PE pipes are robust, flexible, and offer the installer many cost saving advantages. Whilst they are resistant to site damage, normal care and good housekeeping practices are necessary to ensure trouble free operations.

Handling

Handling of Vinidex PE pipes is made easier due to the light weights of both coiled and straight length pipe. Care must be exercised however, to avoid damage to the pipe walls, pre-assembled end fittings, or sub assemblies.

Safety aspects need to be addressed, as the nature of PE pipes is such that in cold and wet weather the pipes become slippery and difficult to handle. In these circumstances, additional care should be exercised when handling coils or bundles of pipe. In hot weather, especially with black pipes, the pipe surface may reach 70°C, when the ambient temperatures reach 40°C. Handling PE pipes at these temperatures requires gloves, or other protection, to prevent the possibility of skin burns.

Fabric slings are recommended for lifting and handling PE pipe in order to prevent damage.

Where wire ropes or chains are used, then all of the contact points between the slings and the pipe must be protected by suitable padding. Where pipes are in coils, the slings must be placed evenly around the entire coil. Similarly, where coils or straight lengths are lifted by fork lift the contact points must be protected. When lifting coils, the lifting must be performed on the entire coil, and the fork lift tynes not inserted into the coil winding. When lifting packs of pipes, the tynes must be placed under the entire pack, and the tynes not pushed into the pack. Pipes must not be lifted by placing metal hooks into the ends of straight lengths.

In conditions approaching freezing, the impact resistance of PE reduces, and care must be exercised to prevent damage during handling.

Pipe lengths greater than 6 metres should be lifted using a spreader bar, and wide band slings. PE pipes will flex during lifting, and care needs to be exercised to prevent damage to pipes or end fittings arising from contact with the ground. Care needs to be taken to centre the pipe in the slings.

A reduction in the pipe wall thickness of up to 10% may be tolerated. However, sections with sharp notches should be rejected, or the damaged area buffed out to remove the sharp edges.

Transport

PE pipes stacked for transport must be evenly supported in order to prevent distortion. All bearing surfaces must be free from contact with sharp objects. Any projecting sections such as stub flanges must be supported to prevent damage.

For straight lengths of pipe, suitable support beneath the pipes is provided by beams of minimum width 75 mm, spaced horizontally at 1.5 m centres. For rectangular stacks, additional vertical supports at 3 metre spacing should be used. For pyramid stacks, the bottom pipe layers also need to be chocked to prevent stack collapse.

For large diameter pipes (DN 630 and above) it may be necessary to tom, or internally support the ends of the pipe in order to prevent distortion.

Where end treatments such as flanges are applied in the factory, these treatments must be protected from damage.

Where coils are stacked vertically the stacks may need to be restrained in order to prevent the bottom section of the coil being flattened or distorted.

Storage

Straight length pipes must be supported by timber spacers of minimum width 75mm placed at 1.5 metre centres. The recommended maximum height of long term stacks is as listed in Table 5.1. Where pipes are crated, the crates may be stacked on timber to timber, in stacks up to 3 metres high.

PE pipes are capable of supporting combustion, and need to be isolated from ignition sources. PE pipes must be kept away from high temperature sources, and not be in contact with objects of temperature higher than 70°C. Storage of PE pipes in field locations may be subject to fire regulations, and the requirements of the local authorities must be observed.

Black pipes do not need protection from the effects of UV exposure, but coloured pipes, if potentially exposed for longer than 6 months, may need protection.

In selecting the method of protection consideration may need to be given to temperature effects, as elevated temperatures may lead to pipe distortion.

Table 5.1 Storage Height

Straight Lengths

PE Material	Height (m) up to SDR 21	Height (m) above SDR 21
MDPE (PE63, PE80B)	2.0	2.25
HDPE (PE80C, PE100)	2.0	2.50

Coils

Pipe diameter mm	Coil stacks (number)
up to 32	5
50, 63	4
90, 110	2

Note: Coils must be stacked flat, and even.

Site Preparation

Trench Preparation

All other services must be located (such as telephone conduits, gas, water mains, sewers, electrical conduits, and cable TV conduits) in the area of the PE pipeline before any work commences. This may require some localised excavation, and all safety requirements must be observed.

When pipes are installed on the natural surface, the pipeline route must be clear of obstructions and where required, sufficient space must be allowed for expansion/contraction movement.

PE pipes may be joined outside the trench, allowing narrower trenches and consequent reduced excavation cost.

PE pipes have a density less than that of water, and may float if water is present in the trench, and the pipes are not restrained. Trench excavations need to be kept free of water, and if necessary, dewatering equipment installed.

Trench Widths

Table 5.2 lists recommended trench widths. These values are consistent with the principles that trench width should be as narrow as possible in order to minimise external loads and installation costs, whilst also affording sufficient space to provide the specified compaction.

The actual trench width adopted will be influenced by the soil conditions, the jointing systems, and whether joints are made in the trench.

Table 5.2 Recommended Trench Widths

Pipe Diameter (mm)	Minimum Trench Width (mm)
16 to 63	150
75 to 110	250
125 to 315	500
355 to 500	700
630 to 710	910
800 to 1000	1200

Table 5.3 Minimum Cover

Installation Condition		Cover over pipe crown (mm)
Open Country		300
Traffic Loading	No pavement	450
	Sealed pavement	600
	Unsealed pavement	750
	Construction equipment	750
	Embankment	750

Poor soil conditions may necessitate a wider trench to accommodate support structures or dewatering equipment, and the ready removal of this equipment after the pipes have been laid. Where such supports are used, they must be removed with care, in order to prevent disturbance of pipe, bedding or trench walls.

Pressure pipes, especially in rural areas, may be installed in narrow trenches with sufficient space to allow the backfill of the trench. No additional compaction may be necessary, and the natural soil consolidation allowed to occur with time.

Where PE pipes are installed with other services in common trench situations, the trench width may be specified by Local Authority regulations in order to permit later maintenance activities.

Trench Depths

Where the PE pipe grade line is not specified, the cover over the top of the PE pipes needs to be set so that adequate protection from external loads, third party damage, and construction traffic is provided.

Where possible, pipes should be installed under minimum depth conditions and, as a guide, the values listed in Table 5.3 above should be adopted.

Trench walls in poor soil conditions may need to be excavated in steps, or be battered, to prevent collapse of the trench wall materials.

For embankment installations, a sub trench may be excavated once the embankment has been partly built up, in order to help protect the PE pipes from construction vehicles, and also lessen the external loads acting on the pipe.

Bedding Material

The excavated trench floors must be trimmed even, and be free from all rocks, and hard objects.

In poor soil conditions, an additional layer of imported bedding material may need to be introduced, and a geofabric restraint of bedding/backfill material may be required.

The bedding materials used in both trenchs and embankments shall follow the guidelines of AS2033, and should be one of the following:

1. Sand or soil, free from rocks greater than 15 mm, and any hard clay lumps greater than 75 mm in size.
2. Crushed rock, gravel, or graded materials of even grading with a maximum size of 15 mm.
3. Excavated material free from rocks or vegetable matter.
4. Clay lumps which can be reduced to less than 75 mm in size.

Excavated materials in accordance with 3. and 4. above are often used for pressure pipelines and in rural areas.

However, in areas of high loading, such as under roads, imported materials may need to be used.

In the majority of PE pipe applications, a minimum of 75 mm of bedding material is used in both trenches and embankments in soil excavations. For excavations in rock, 150 mm bedding depth may be required.

Where fittings or mechanical joints are used, the bedding material may need to be excavated to prevent point loading. All pegs and markers used in aligning and levelling the pipes must be removed from the trench floor prior to bedding materials being placed.

Side Support & Overlay

PE pipes act as flexible pipes to resist external loading, and the side support materials must be evenly added to the same compaction standards as the bedding materials so that the installed PE pipe is not disturbed.

Sidefill materials should be built up equally on both sides of the pipes in layers of 150mm, and compacted evenly to the AS/NZS 2566 design level. The sidefill materials must be carefully placed around the haunches of the pipes to ensure that the PE pipes are evenly supported.

Vibrating plate compactors must not be used until there is a 300mm layer of overlay soil over the crown of the PE pipe.

Detector tapes, or marker strips, should be laid on top of the overlay once a layer of 150mm soil has been compacted.

The overlay materials should be built up in compacted layers until the overlay material is to a level of a minimum of 150 mm above the top of the PE pipes. (See Figure 5.1). Large diameter (450 mm and above) PE pipes require the overlay materials to be carried to a cover of 300mm above the top of the PE pipes.

Backfill

The remainder of the trench, or embankment fill may be made with the previously excavated native materials. These must be free from large rocks, vegetable matter, and contaminated materials, and all materials must have a maximum particle size less than 75 mm.

Where PE pipelines are installed in areas with high external loads, then the backfill materials must be of the same standard as the bedding and overlay materials.

Compaction Standards

It is essential that the AS/NZS 2566 compaction levels are attained, as PE pipes behave as flexible structures. Large diameter PE pipe installations may require the compaction at each stage of the installation to be confirmed by test.

Where high external loads are encountered, or where it is not possible to attain the required level of compaction in the sidefill materials, a mixture of sand/cement in the ratio of 14:1 may be used in the sidefill zones.

The selection of compaction standard used in the sidefill materials needs to be taken from AS/NZS 2566 for the sidefill materials available on the particular site.

Figure 5.1
Trench Installations

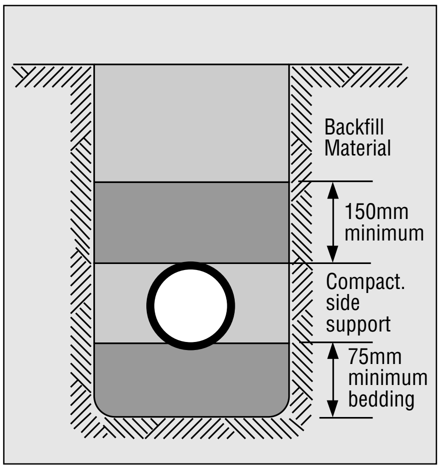
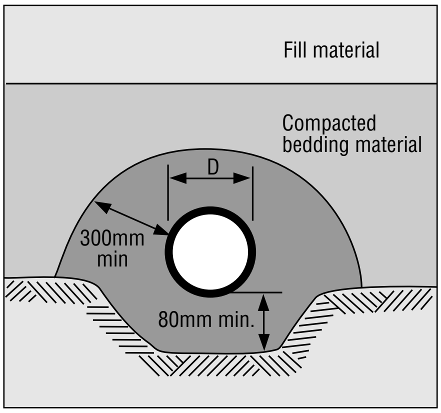


Figure 5.2
Embankment Installations



Thrust Blocks & Pipe Restraint

Thrust blocks are required for Vinidex PE pipes in pressure applications where the joints do not resist longitudinal loads. The thrust blocks must be provided at all changes in direction. The standard methods of calculating the size of thrust blocks for all pipeline materials are those used with PE pipes and are contained in the Design section of this manual.

Where concrete blocks are used, the contact points between the PE pipe, or fitting and the thrust block must be protected to prevent abrasion of the PE. Rubber or malthoid sheeting may be used for this purpose.

All fittings and heavy items such as cast iron valves must be supported in order to prevent point loading on the PE materials. In addition, where valves are used, the torque loads arising from the opening/closing operations must be resisted with block supports.

Pipeline Curvature

All PE pipes installed on a curved alignment must be drawn evenly over the entire curve length, and not over a short section. This can lead to kinking in small diameter, and/or thin wall pipes.

Large diameter PE pipes (450mm and above) must be joined together, and then drawn evenly to the desired radius.

Care must be exercised during construction to prevent over stressing of joints and fittings. Where mechanical joints are used, any joint deflection limitations must be observed. During installation, minimum radii of 20 x DN for MDPE (PE63 and PE80B) and 33 x DN for HDPE (PE80C and PE100) may be used.

In addition, evaluation of buckling resistance of thin wall pipes may be necessary. This should be done as shown in the Design Section of this Manual.

Relining & Sliplining

Vinidex PE pipes have the chemical resistance properties and longitudinal flexibility to provide an ideal solution for relining existing corroded or damaged pipelines in water supply, sewers, and drain applications.

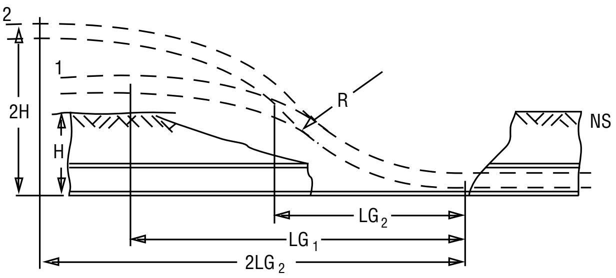
Existing pipelines used to transport aggressive and dangerous fluids may be restored by relining techniques, and cost effective solutions are provided by eliminating the need for open cut trenches in urban and heavily built up areas. Installations can be planned around off peak traffic periods to minimise disruption and reduce installation times.

Existing pipelines can be renovated by inserting Vinidex PE pipes into the old pipes. Insertion pipes can be pulled into position by mechanical winches.

Although insertion of the PE pipes will reduce the internal diameter of the pipeline, the effective flow capacity of the renovated line may in fact be greater than the existing installation due to the improved pipe wall friction factors of PE as compared to the existing pipe with heavily corroded or damaged internal surfaces. Inspection of the existing line should be performed by CCTV to provide data as to the actual likely flow friction factors.

Relining with PE pipes provides a structural element that is capable of withstanding either internal pressure or external loading without relying on the residual strength of the original degraded pipe elements.

Figure 5.3 PE Sliplining Trench Opening



The PE pipes require short length inlet and exit trenches to accommodate the PE pipe radius to lead into the existing pipeline, and the winch assembly used to pull the PE liner along the pipeline. The minimum bending radius of the PE liner can be calculated as described under Pipeline Curvature in this section of the manual.

The dimensions (Refer to Figure 5.3) of excavations required for slip lining are:

1. Where the PE insert pipe is on the natural surface level

$$LG_1 = \sqrt{H(4R - H)}$$

2. Where the PE insert pipe is at a height H above the natural surface level

$$LG_2 = \sqrt{H(2R - H)}$$

where

H = depth to invert of existing pipeline

R = radius of liner pipe

Grouting

Grouting of the gap between the outside diameter of the PE liner, and the inside of the existing pipe is necessary only when the original pipe has been damaged to the extent that there is no residual external load capacity, or where manhole connections cannot be sealed off to prevent groundwater infiltration.

Where grouting is applied, the pressure should not exceed 50 kPa, and depending on the PN rating of the PE liner pipe, external collapse calculations should be carried out. Where cement based grouts are used, the temperature rise in the PE liner due to the heat of hydration must be taken into account.

The PE liner pipes may be filled with water prior to grouting to increase the external pressure resistance, and to provide additional line weight to prevent the PE liner pipe floating during grouting, and losing the final grade line.

Excavation

Sliplining existing pipes using Vinidex PE pipes allows for a reduction of excavation in built up areas.

Only the excavation necessary to feed the PE liner pipe into the existing line is required and depending on the total length of the line and the location of existing manholes, a liner length of approximately 100 metres may be drawn along the line in each section. For small diameter pipes, the PE can be supplied in Vinidex pipe reels. This allows for a single run of PE to be inserted into existing pipe without the need for intermediate jointing.

Where the existing service cannot be taken out of service, or temporarily blocked off during the relining process, extra excavation may be required to allow for the installation of a temporary diversion line.

Jointing the Liner

Depending on the diameter of the pipe, a single length of PE pipe can be installed to provide a single length of seamless liner.

For larger (160mm and above) PE pipes can be butt welded above ground on site to provide a continuous length pipe which can be inspected for joint integrity before installation.

The butt weld process provides a joint which resists longitudinal load and has the same chemical resistance properties as the pipe. The external diameter weld bead sections may be mechanically removed prior to insertion to prevent any possibility of snagging on damaged sections, or protrusions, in the bore of the existing pipe to be relined. Where weld beads are removed, care must be taken not to notch the PE pipe wall. Butt welded joints must be allowed to cool to ambient temperature prior to drawing into the final position so as to prevent any damage to the joint section.

Pipeline Detection

Vinidex PE pipes are electrically non conductive and cannot be detected by metallic detection devices in underground installations.

Several techniques are available to detect buried PE pipelines.

Metal Detector Tapes

Foil based tapes may be located in the trench on top of the PE pipe overlay material (150 - 300 mm above the PE pipe crown), and these tapes can be detected at depths up to 600 mm by metal detection equipment operating in the 4 - 20 MHz frequency range.

The tape backs may also be colour coded and printed in order to provide early warning of the presence of the PE pipeline during later excavation.

Tracer Wires

PE pipes installed deeper than 600 mm may be detected by the use of tracer wires placed on, or taped to, the top of the PE pipes.

Application of a suppressed current allows the detection of pipes up to a depth of 3 metres. However, both ends of the tracer wire must be accessible, and a complete electrical circuit present over the entire length of the pipeline.

Audio Detection

Acoustic, or ultra sonic, noise detection devices are available which use either the noise from water flowing in the pipes, or an introduced noise signal, to detect the presence of buried PE pipelines.

Above Ground Installation

Vinidex PE pipes may be installed above ground for pressure and non pressure applications in both direct exposure and protected conditions.

Black PE pipes made to AS/NZS 4130 requirements may be used in direct sunlight exposure conditions without any additional protection. Where PE pipes of colours other than black are used in exposed conditions, then the pipes may need to be protected from sunlight.

Where PE pipes are installed in direct exposure conditions, then the increased PE material temperature due to exposure must be taken into account in establishing the operational pressure rating of the PE pipes. Localised temperature build up conditions such as proximity to steam lines, radiators, or exhaust stacks must be avoided unless the PE pipes are suitably protected. Where lagging materials are used, these must be suitable for external exposure applications.

For Vinidex Geberit waste systems, the pipes are manufactured specifically for the application and reference should be made to Vinidex engineers for comprehensive installation details.

Supports

Pipe hangers, or supports, should be located evenly along the length of the PE pipeline, and additionally at localised points with heavy items such as valves, and fittings.

The supports should provide a bearing surface of 120° under the base of the pipes. The PE pipes may need to be protected from damage at the supports. This protection may be provided by a membrane of PE, PVC or rubber.

Location and type of support must take into account provision for thermal movement, if required. If the supports are to resist thermal movement, an assessment of the stress induced in pipes, fittings and supports may need to be made.

Support Spans

Support spans depend on the pipe material and dimensions, nature of flow medium, operating temperature, and arrangement of the pipes.

In calculating support spans, a maximum deflection of spans/500 between supports has been adopted as the basis.

The spans in Table 5.4 are based on the use of PE80B (MDPE), full of water, support over multiple spans, and operating at 20°C for 50 years.

For other service temperatures, the spans should be reduced as follows:

30°C	5%
40°C	9%
50°C	13%

For fluids with density between 1000 kg/m^3 and 1250 kg/m^3, decrease spans by 4%.

For Vinidexair systems, the spans may be increased by up to 30%.

Vinidex Systems & Solutions

Table 5.4 Support Spans (metres)

	SDR (Standard Dimension Ratio)								
DN	41	33	26	21	17	13.6	11	9	7.4
16	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
20	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.65	0.65
25	0.65	0.65	0.65	0.65	0.65	0.70	0.70	0.75	0.75
32	0.70	0.70	0.70	0.70	0.75	0.80	0.85	0.90	0.90
40	0.80	0.80	0.80	0.80	0.90	0.90	1.00	1.00	1.10
50	0.85	0.85	0.90	0.95	1.00	1.10	1.15	1.20	1.25
63	0.95	1.00	1.05	1.10	1.20	1.25	1.30	1.40	1.45
75	1.00	1.10	1.20	1.25	1.35	1.40	1.50	1.55	1.60
90	1.15	1.25	1.35	1.40	1.50	1.60	1.65	1.75	1.80
110	1.35	1.40	1.55	1.60	1.70	1.80	1.90	2.00	2.10
125	1.45	1.55	1.65	1.75	1.85	2.00	2.10	2.20	2.30
140	1.55	1.65	1.80	1.90	2.00	2.10	2.25	2.35	2.45
160	1.70	1.80	1.95	2.10	2.20	2.30	2.45	2.55	2.65
180	1.85	1.95	2.10	2.25	2.35	2.50	2.65	2.80	2.90
200	1.95	2.10	2.25	2.40	2.55	2.70	2.85	3.00	3.10
225	2.15	2.30	2.45	2.60	2.75	2.90	3.05	3.20	3.35
250	2.30	2.45	2.60	2.75	2.95	3.10	3.30	3.45	3.60
280	2.45	2.65	2.80	3.00	3.20	3.35	3.55	3.70	3.90
315	2.65	2.85	3.05	3.25	3.45	3.65	3.85	4.05	4.20
355	2.90	3.10	3.30	3.50	3.75	3.95	4.15	4.35	4.55
400	3.10	3.35	3.55	3.80	4.05	4.25	4.50	4.70	4.90
450	3.40	3.60	3.85	4.10	4.35	4.60	4.85	5.10	5.35
500	3.60	3.85	4.15	4.40	4.70	4.95	5.20	5.50	
560	3.90	4.15	4.50	4.75	5.05	5.35			
630	4.20	4.50	4.85	5.15	5.45	5.80			
710	4.60	4.90	5.25	5.60	5.95	6.30			
800	4.95	5.30	5.70	6.05	6.45	6.85			
900	5.35	5.70	6.10	6.55	6.95				
1000	5.80	6.15	6.55	7.00	7.35				

Expansion & Contraction

For above ground pipelines, expansion and contraction movements should be taken up by the pipeline where possible without expansion joints.

This may be achieved in lines laid directly on the natural surface by snaking the pipe during installation and allowing the pipe to move freely in service. Where the final joint connections are made in high ambient temperature, sufficient pipe length must be allowed to permit the pipe to cool, and hence contract, without pulling out of non end load bearing joints.

Accommodation of Thermal Movement by Deflection Legs

Changes in length are caused by changes in operating temperatures. On installation of piping systems above ground, attention must be paid to compensate for axial movements.

In most cases, changes in direction in the run of piping may be used to absorb length change, given that appropriate deflection legs are provided. Otherwise, compensation loops or special fittings may need to be installed.

Table 5.5 lists minimum deflection leg lengths for given run length changes. See Figures 5.4 and 5.5.

For non-pressure applications, these values may be reduced by 30%, or for Vinidex Geberit systems, up to 60%. For specific data, reference should be made to Vinidex engineers.

The deflection leg is expressed by:

$$L_S = k \cdot \sqrt{\Delta L \cdot DN}\,[mm]$$

where

L_s = deflection leg (mm)

ΔL = change in length (mm)

DN = pipe outside diameter (mm)

k = material specific proportionality factor (average value for PE of 26)

Table 5.5 Minimum Deflection Leg Lengths (m)

	Change in Run length ΔL (mm)								
DN	50mm	100mm	150mm	200mm	250mm	300mm	350mm	40mm	450mm
16	0.75	1.05	1.30	1.50	1.65	1.85	1.95	2.10	2.35
20	0.85	1.15	1.45	1.65	1.85	2.05	2.20	2.35	2.60
25	0.95	1.30	1.60	1.85	2.10	2.25	2.45	2.60	2.90
32	1.05	1.50	1.85	2.10	2.35	2.55	2.80	2.95	3.30
40	1.15	1.65	2.05	2.35	2.60	2.85	3.10	3.30	3.70
50	1.30	1.85	2.25	2.60	2.90	3.20	3.50	3.70	4.15
63	1.50	2.10	2.55	2.95	3.30	3.60	3.85	4.20	4.65
75	1.60	2.25	2.80	3.20	3.60	3.90	4.25	4.50	5.05
90	1.80	2.50	3.05	3.50	3.90	4.30	4.65	4.95	5.55
110	1.95	2.75	3.40	3.85	4.35	4.75	5.15	5.50	6.15
125	2.10	2.90	3.55	4.15	4.60	5.05	5.50	5.85	6.55
140	2.20	3.10	3.80	4.40	4.90	5.35	5.80	6.20	6.90
160	2.35	3.30	4.05	4.70	5.20	5.75	6.20	6.60	7.40
180	2.50	3.50	4.30	4.95	5.55	6.10	6.55	7.00	7.80
200	2.60	3.70	4.50	5.20	5.85	6.35	6.90	7.40	8.25
225	2.80	3.90	4.85	5.55	6.20	6.80	7.35	7.85	8.80
250	2.90	4.15	5.05	5.85	6.55	7.20	7.75	8.25	9.20
280	3.10	4.35	5.35	6.20	6.90	7.55	8.20	8.70	9.80
315	3.30	4.65	5.70	6.55	7.35	8.05	8.70	9.25	10.35
355	3.50	4.90	6.05	6.95	7.80	8.55	9.20	9.85	11.00
400	3.70	5.20	6.40	7.40	8.25	9.05	9.80	10.45	11.70
450	3.90	5.55	6.80	7.85	8.80	9.60	10.40	11.10	12.40
500	4.15	5.85	7.20	8.25	9.25	10.15	10.90	11.70	-
560	4.40	6.20	7.55	8.75	9.80	10.70	-	-	-
630	4.65	6.55	8.05	9.25	10.40	11.35	-	-	-
710	4.90	6.95	8.55	9.80	11.00	12.05	-	-	-
800	5.25	7.40	9.10	10.50	11.75	12.80	-	-	-
900	5.60	7.90	9.65	11.10	12.50	-	-	-	-
1000	5.85	8.30	10.15	11.70	13.10	-	-	-	-

Figure 5.4
Absorption of change in length by deflection leg

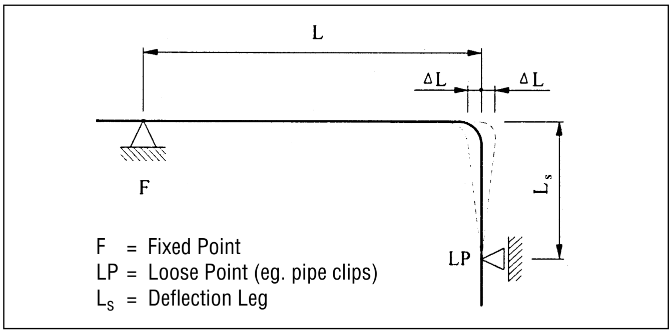
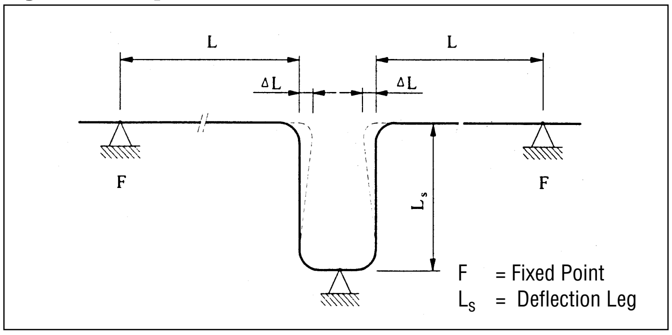


Figure 5.5
Absorption of change in length by a compensation elbow



Vinidex
Systems & Solutions

Service Connections

Tapping Saddles

Service connections may be provided in PE pipe systems using tapping saddles which are either electrofusion or mechanically connected.

Tapping saddles should not be installed closer than 100mm to prevent reduction in pressure capacity in the pipeline.

A range of tapping saddles suitable for use with Vinidex PE pipes are listed in the Product Data section of this manual.

Tapping saddles may be used for tappings up to 30% of the size of the main pipe or a maximum diameter of 50mm. Where larger offtake sizes are required, then a reducing tee section should be used.

Tapping saddles of the mechanical strap type should not be used on curved pipes. Tapping saddles of the saddle fusion, or electrofusion type should only be used on the top of curved lines, and not be closer to the end of the pipe than 500mm.

Connection may then be made without loss of the operating service.

Alternatively, tapping may be performed on new main lines prior to pressurisation, and entry into service using the same techniques.

Direct Tapping

The tapping of services directly into the pipe wall by drilling and tapping a thread in the wall material is not recommended in PE pipes.

This practice may lead to premature failure of the system.

Concrete Encasement

At entry and exit points of concrete slabs or walls, a flexible joint must be provided in the PE pipeline to cater for movements due to soil settlement, or seasonal expansion/contraction of the soil.

Where expansion joints are provided in the concrete slab, expansion joints should be provided at the same point in the pipeline. At these points a flexible membrane should be provided to prevent shear stresses developing across the joint.

PE pipes behave as flexible structures when externally loaded, and care needs to be exercised by the designer when using concrete encasement so that the effective strength of the pipeline is not reduced.

Fire Rating

PE pipe systems will support combustion and as such are not suitable for use in fire rated zones in buildings without suitable protection. The individual fire rating indices for PE materials may be established by testing to the requirements of AS1530.

In multiple storey buildings PE systems penetrating floor cavities must be enclosed in fire rated service ducts appropriate to the Class of the building concerned.

Testing & Commissioning

Pressure Installations

Pre Test Precautions

Prior to testing, the entire PE pipeline should be checked to ensure all debris and construction materials are removed from contact with the pipes and fittings.

Where concrete anchor or thrust blocks are used no pressure testing should take place within 7 days of casting the blocks.

All mechanical ring seal joints must be restrained either by sand bags, or by partial backfilling of the line leaving the joints open for visual inspection. All valves must be placed in the open position, and a valve provided at the end of the line to allow air to be vented from the line during filling.

Where thermal fusion jointing has been used, no testing should take place until the joints have completely cooled to ambient temperature.

Local authority regulations may differ between each other in the pressure testing routines, and individual requirements must be followed at all times.

Pressure Testing

Test water should be slowly introduced into the PE pipeline until all air is purged from the line and water flows freely at the end of the line. The water should preferable be introduced into the pipeline at the lowest point to assist the removal of air.

It is **essential** that all air is removed from the line prior to commencing the test procedure. Entrapped air can result in erroneous pressure/time recordings.

Test sections may be either the complete line, or, in large installations, in sections such that the test section can be filled with water within 5 hours to allow pressure observations.

Pressure should be built up evenly in the line without pressure shock.

A test pressure of **1.25 times the maximum working pressure** should be applied for pipelines up to 110 mm in diameter and 100 metres in length and also for testing valve anchorages. The test pressure in these instances should be held for a minimum period of 15 minutes, and the pressure gauges inspected for pressure drop readings.

In addition, all joints must be visually inspected for evidence of weeping or leakage.

For large diameter pipes, and for pipeline lengths up to 800 metres, the elastic properties of PE are such that the introduction of test pressures will cause expansion in the line and require make up pressure to restore gauge readings. This volume make up will generally be in the order of 1%, and may be applied at the time of initial pressurisation. The test pressure of **1.25 times the maximum working pressure** should be maintained for a maximum period of 24 hours, or for the time necessary to visually inspect all joints in the line.

A smaller drop in pressure may be observed due to thermal expansion. However, this does not indicate leakage in the pipeline.

Where the installation consists of small additions to existing pipelines the test pressure period may be 15 minutes.

The maximum test pressure to be applied **must not exceed 1.25WP.** Test pressure in excess of this value may strain the pipe material and damage control appliance s connected to the pipeline.

High pressure testing using air must not be carried out.

Note:
Where the time of pressure testing exceeds 15 minutes, increases in pipe temperature above 20°C may occur. In these cases the test pressure must be derated.

Refer to Table 4.7 in the Design section of this manual.

Non Pressure Installations

1. Above Ground

All sections of the installation should be sealed off and water introduced through a stand pipe to provide a static head of 3 metres above the top point in the PE pipeline. All openings in the PE pipeline must be sealed, or plugged, before starting testing. Either water or air testing may be performed on non pressure PE pipelines, depending on the availability of test water, or the ability to drain the test water away from the pipeline alignment after the testing is completed.

2. Below Ground

(a) Water Testing

For PE drain lines, a riser pipe should be fitted at the top point in the pipeline to allow a minimum water head of 1 metre to be applied. For waste water applications, a water test pressure of a **maximum of 1.25 WP (maximum head at the lowest point)** should be applied by either a stand pipe connection, or using a test pump.

The test water should be introduced evenly into the pipeline, and brought up to pressure after allowing all entrapped air to be purged out of the line.

All joints and connections should be inspected for leakage, and the test pressure maintained for a minimum period of 15 minutes after the final joint has been inspected, or for a period of 30 minutes.

No leakage or loss of pressure should take place in this period.

Large diameter installations may require a period of up to 8 hours to allow for complete inspection of all joints in the pipeline network.

(b) Air Testing

Where water is unavailable, or undesirable, for testing then air testing may be performed.

All openings must be sealed prior to testing, and air pumped slowly into the PE pipeline until a test pressure of 50KPa is reached.

This test pressure should be maintained for a minimum time of 3 minutes, and if no leaks are detected, or pressure loss observed on the gauge, the air supply control valve should be turned off and the test pressure held for a minimum time of 1 minute.

If the test gauge pressure reading has not fallen below 35KPa after this time, then the test should be discontinued.

Should the test pressure drop below 35KPa after 1 minute, then the pressure should be returned to 50KPa and maintained until a full inspection of the PE pipeline has been completed. All joints and connections need to be individually inspected for leakage using a solution of water and detergent poured over any suspect joint. If a leak is present, it will cause the detergent solution to bubble, and foam.

Deflection Testing

PE drainage pipelines are designed to support external loading within the acceptable limits of diameter deflection for structural reasons.

Where this is a critical feature of the installation, then a plug, or proving tool, can be pulled along the PE pipeline between manholes, or other entry points.

For joints without any protrusions into the pipe bore, the proving plug can be sized to the minimum internal dimension allowed in the design. For butt welded pipes, unless the internal beads are removed, the plug needs to be reduced in size to allow for the weld bead.

In both cases, the plug must be able to be pulled completely through the PE pipeline.

Flushing and Disinfection

Where Vinidex PE pipes are used for potable water applications, standard flushing and disinfection procedures must be followed.

Some pipe materials require additional flushing or disinfection in order to purge contamination rising from the pipe material itself. Vinidex PE pipes, however, are made from PE grades that comply with water quality requirements without additional treatment.

For potable water applications, the following procedure may be used:

1. Flush out all construction debris from the pipes by running water through the line for 15 minutes.
2. Carry out the hydrostatic pressure testing.
3. Introduce a chlorine, or chloramine, solution into the line at a concentration of 50 mg/l, and allow to stand for 24 hours.
4. Flush out the pipeline for 15 minutes to remove all disinfectant and biological residues from the water.

Vinidex
Systems & Solutions