

IPLEX RESTRAIN®

PVC PIPE FOR TRENCHLESS INSTALLATION
DESIGN AND INSTALLATION GUIDE





The background image shows a multi-story building with a sign that says "VOICE" and "voice.co.nz". In the foreground, there is a construction site with a yellow excavator, a silver car, and a road blocked by red and yellow plastic barriers and orange traffic cones. A semi-transparent blue box is overlaid on the image, containing the text.

The Iplex® vision is to be the leading manufacturer and supplier of plastic building materials in New Zealand.

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SECTION 1

INTRODUCTION

IPLEX RESTRAIN® INTRODUCTION

Iplex Pipelines has developed Restrain® PVC Sewer Pipe specifically for gravity sewer applications using trenchless techniques, for the installation, repair or replacement of underground infrastructure.

Restrain® is a rubber ring jointed, SN16 PVC-U sewer pipe, utilizing a threaded spigot and “low profile” threaded socket, which provides axial end load restraint.

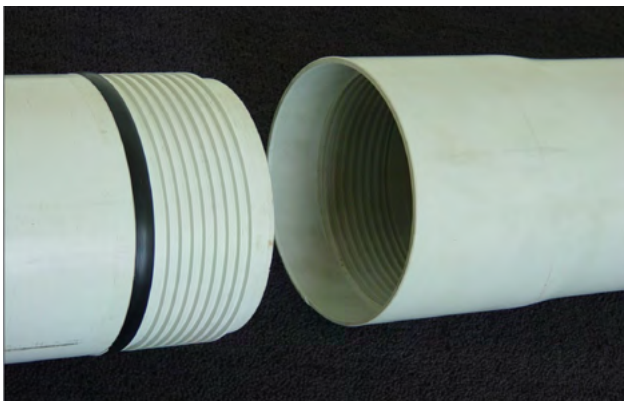


Figure 1.1 Typical joint arrangement showing the rubber sealing ring, threaded spigot and “low profile” threaded socket.

Applications

Iplex Restrain® Sewer Pipe has been designed for gravity sewer applications and is suitable for installation by a range of trenchless methods, including:

- Horizontal Directional Drilling (HDD)
- Pipe Reaming (PR) or Pipe Eating (PR-PE)
- Pipe Bursting Static (PB-ST)
- Pipe Bursting Hydraulic (PB-HY)
- Pipe Bursting Slitting (PB-SL)
- Pilot Tube Micro Tunnelling (PTMT)
- Horizontal Auger Boring (HAB)
- Slip Lining (SL)

Restrain® PVC Sewer Pipe is not suitable for use with pneumatic or concussive pipe bursting equipment. It is also not suitable for pipe ramming or impact moling

Features and benefits

The threaded spigot and socket provides axial end load restraint to ensure joint integrity during installation using trenchless techniques.

Iplex Restrain® PVC Sewer Pipe is compatible with both solvent weld and rubber ring jointed DWV PVC-U Sewer Pipe and fittings complying with AS/NZS 1260.

Restrain® is available in a range of pipe lengths from 1m to 3m to suit project and site requirements. The Restrain® socket is “low profile”, i.e. has a smaller outside diameter than a conventional “Solvent Weld” style PVC pipe socket.

TABLE 1

FEATURE	BENEFIT
Threaded socket & spigot joint	Allows axial restraint during installation using trenchless methods
Pipe lengths of 1m, 2m & 3m to suit the project requirements	Enables use with a range of installation technologies or site requirements
Compatible with standard DWV PVC Sewer fittings to AS/NZS 1260	Allows connection to maintenance chambers and service laterals
Bi-directional installation capability	Pipe can be pushed or pulled into place to suit installation methodology
Elastomeric seal ring performance conforming to AS/NZS 1260	Designed to prevent the risk of leakage and root intrusion
Manufactured in accordance with AS/NZS 1260. (StandardsMark licence number SMK-P 20184)	Product meets industry manufacturing and performance standard
Manufactured from PVC-U	Compatible with standard PVC-U drainage fittings
Manufactured in stiffness class SN16	Provides the structural performance of SN16

Iplex Pipelines NZ Ltd retain the intellectual property rights for Restrain® pipe; New Zealand Patent No. 561752.

SECTION 2

PRODUCT DATA

IPLEX RESTRAIN®

PRODUCT DATA

Iplex Restrain® is a DWV sewer pipe with a threaded spigot and socket assembly, with a rubber sealing ring. Restrain® is manufactured in accordance with AS/NZS 1260 "PVC-U pipe for drain, waste and vent applications" - (StandardsMark licence number SMKP 20184.)

Material Properties

Restrain® is manufactured from PVC-U (unplasticised polyvinyl chloride). The properties listed in Table 2 are typical for PVC-U Sewer Pipes.

For more technical specifications and chemical resistance information please refer to the Iplex website www.iplex.co.nz or contact an Iplex Pipelines Engineer.

Pipe Stiffness

All Restrain® PVC Sewer Pipe is manufactured with a minimum pipe ring bending stiffness of 16000 N/m.m and is classified as SN16, to AS/NZS 1260.

Standards & Testing

Iplex Pipelines NZ Limited satisfies the requirements of ISO 9001 "Quality Management Systems - requirements". (Licence No. QEC4169)

Iplex Restrain® is manufactured in accordance with AS/NZS 1260 "PVC-U pipe and fittings for drain, waste and vent application". (StandardsMark Licence No. SMKP20184)



Figure 2.1 Restrain® installation by Auger Boring, at 10.8 metres to invert

TABLE 2

Mechanical Properties for PVC-U Sewer Pipe

PROPERTY	VALUE & UNIT
Density	1450 kg/m ³
Ultimate tensile strength	44.7 MPa*
Compressive strength	66 MPa*
Ring Bending Modulus (3min)	3200 MPa
Ring Bending Modulus (50 yr)	1400 MPa
Hardness (Shore)	85 (ASTM D2240)
Hardness (Brinell) at 23°C	12 - 15
Poisson's Ratio	0.38
Coefficient of linear thermal expansion	7.0 x 10 ⁻⁵ /m/m/°C

*Refer to Table 5 Page 12 for maximum allowable axial loads for Restrain®



Figure 2.2 Restrain® installation by Slip lining into a concrete host

SECTION 3

PRODUCT RANGE

IPLEX RESTRAIN® PRODUCT RANGE

Restrain® Sewer Pipe is available in nominal diameters DN100, DN150, DN225 and DN300.

Restrain® is available in lengths ranging from 1m to 3m to suit project specific and/or site requirements. The length of the pipe is generally a function of the method of installation and site space requirements.

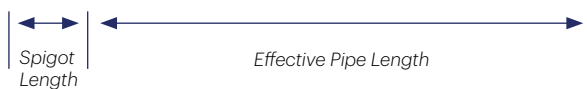
Pipe Fittings

Restrain® PVC Sewer Pipe is compatible with standard PVC-U sewer pipes and fittings for both solvent weld and rubber ring joints. A list of fittings is available from the Iplex Product Catalogue.

Pipe Dimensions

Restrain® PVC Sewer Pipe is available in a choice of three standard lengths; 1m, 2m and 3m effective length.

The overall length of each pipe is generally relevant to the method of installation and site space requirements. Add the spigot length listed in Table 3 to the effective length to determine overall pipe length. Other typical pipe dimensions are shown in this table.



Elastomeric Seal Rings

The elastomeric seal rings are supplied loose, and should be kept clean and stored carefully to ensure that they are not damaged. The seal ring should be mounted on the pipe spigot, in the groove provided, with the convex (rounded) surface of the seal facing outwards, and lubricated with silicone spray during the pipe jointing process. (Refer Section 6, Page 13 & 14.)

Colour & Markings

Restrain® Sewer Pipe is manufactured in a light grey colour with a semi gloss finish which is opaque and flawless.

Iplex Restrain® Sewer pipes are repetitively marked in accordance with AS/NZS1260 'PVC-U pipes and fittings for drain, waste and vent application'.

Markings include:

- Manufacturers name and brand name
- Australian Standard number
- StandardsMark Licence No.
- Nominal Pipe Size
- Pipe Type
- Pipe Class
- Date of manufacture
- Manufacturer's code

Table 3

Restrain® Pipe Dimensions

PIPE DN	MEAN PIPE OD (MM)	SOCKET OD (MM)	SN	MEAN ID (MM)	SPIGOT LENGTH
100	110.2	115	16	101.6	69mm
150	160.3	170	16	147.9	90mm
225	250.4	260	16	231	140mm
300	315.5	330	16	290.8	140mm

SECTION 4

DESIGN

IPLEX RESTRAIN® HYDRAULIC DESIGN

Where a sewer pipeline is flowing full under gravity conditions the method of determining the pipe size is similar to that used for pressure pipes. The grade of the pipeline gives the allowable head-loss but special attention should be given to the effect of entry and exit losses at structures such as manholes as these may be significant.

For pipes flowing full, full capacity can be calculated similarly as for pressure pipes. Contact Iplex Pipelines for Restrain® Flow Capacity information.



Figure 4.1 Restrain installation by Horizontal Directional Drilling



Figure 4.2 Restrain installation by Static Pipe Bursting of a concrete host

IPLEX RESTRAIN® STRUCTURAL DESIGN

Restrain® Sewer Pipes are defined as flexible pipes. Flexible pipes are designed to deflect slightly under load and hence utilise surrounding soil strength, as well as pipe stiffness, to oppose the vertical loads.

Structural design of Restrain® Sewer Pipes should conform to the requirements of AS/NZS 2566.1 "Buried Flexible Pipelines – Structural Design". Contact Iplex Pipelines for more information on structural design of trenchless installations.

Pipe Grouting

Where it is necessary to pressure grout the annulus between Restrain® pipe and a host pipe during slip lining, it is important to ensure that the grout is introduced so as not to damage the Restrain® sewer pipe. The grout must be introduced into the annulus as evenly as possible and must not exceed the Restrain® pipe's maximum safe grouting pressure (refer Table 4).

Table 4

**Maximum Safe Grouting Pressure
(factor of safety = 2.5)**

PIPE DN	MAXIMUM SAFE GROUTING PRESSURE (KPA)
100	180
150	180
225	180
300	180



Figure 4.3 Restrain installation by Pipe Reaming of an earthenware host

SECTION 5

HANDLING AND STORAGE

IPLEX RESTRAIN® HANDLING AND STORAGE

Handling

Whilst Restrain® Sewer Pipes are easy to handle, careless handling can cause unnecessary damage to the pipe and/or joints. Pipes and fittings should not be dropped or thrown onto hard surfaces or allowed to come into contact with hard sharp objects that could inflict deep scratches. PVC-U pipe should not be allowed to slide across sharp edges.

Wire slings or chains **must not be** used to lift pipes. Particular care should be taken to prevent any damage to the thread on the spigot and socket which may affect the axial capacity and/or the jointing process.



Figure 5.1 Handling of bulk bundles.

Storage

If pipes and fittings are to be stored outdoors for more than 12 months they should be protected in a manner that prevents heat build-up and allows ventilation. Hessian or white shade cloth have been shown to be good materials for this purpose.

Pipes may be stacked on site providing the surface is level and free from loose stones and other sharp objects. Pipes should be stacked in layers with sockets placed so that they are not load-bearing. This can be achieved by stacking pipes with alternate layers of sockets facing in opposite directions.

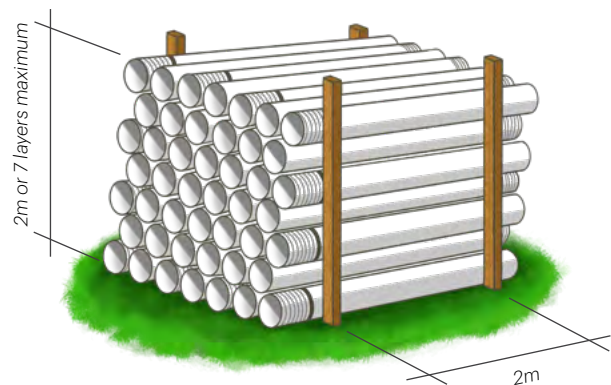


Figure 5.2 Typical loose pipe storage on ground.

Racks for long term storage are recommended and should preferably provide continuous support, however if this is not possible, supports of at least 75mm bearing width at 1m maximum centres should be placed beneath the pipes. Side restraints should be placed at centres not exceeding 2m and stacks should not exceed 1m in height.

When unloading alongside excavated trenches it is recommended that pipes be placed on the opposite side of the trench from excavated material if it is safe to do so.

Rubber rings and silicone spray should be stored under cover until pipe laying commences.

SECTION 6

GENERAL INSTALLATION GUIDELINES

IPLEX RESTRAIN®

STRAP WRENCHES, PIPE JOINTING LUBRICANT & PULL HEADS

General

Restrain® Sewer Pipe can be installed by a number of trenchless methods. A brief description of some of these methods are:

- Horizontal Directional Drilling (HDD)
- Pipe Reaming (PR) or Pipe Eating (PR-PE)
- Pipe Bursting Static (PB-ST)
- Pipe Bursting Hydraulic (PB-HY)
- Pipe Bursting Slitting (PB-SL)
- Pilot Tube Micro Tunnelling (PTMT)
- Horizontal Auger Boring (HAB)
- Slip Lining (SL)

Each installation method has its own unique installation technique, detailed installation instructions by method are reported later in Section 7 of these Guidelines.

Strap Wrenches

Use strap wrenches with extended woven nylon webbing straps for pipe turning during assembly. "Rigid", "Hit" or Super Ego" brand or any Iplex approved equivalent are recommended.



Figure 6.1 Rigid No.5 Strap Wrench

It is recommended that a strap wrench with an extended 1200mm long strap be used to successfully join DN225 and DN300 Restrain® sewer pipe. The Rigid No 5 strap wrench product code #31345 is well proven. The extended strap is an "after market" purchase, any canvas fabricator or upholsterer can stitch the replacement strap together from 45mm wide woven fabric.



Figure 6.2 Rigid No.5 Strap Wrench fitted with replacement after-market 1200mm extended strap

Pipe Jointing Lubricant

Use only "Gensil 601", "CRC 808" or "Rocol" spray silicone lubricant or an Iplex approved equivalent for lubrication of the joint assembly prior to assembly.

The silicone lubricant is used to lubricate the thread and seal ring prior to jointing of the pipes. The silicone lubricant allows the ability to reverse the thread jointing process should the pipes need to be removed from the borehole or installation pit.

Pull Heads

Iplex® recommend the use of a "cone style" pull head as shown in figure 6.4 for HDD, Pipe Bursting, Auger Boring and Micro Tunnelling installations. These pull heads are normally fabricated from mild steel plate or pipe. The pull head is connected to a Restrain® socket starter pipe (2-3 pipe diameters long) fastened to the pull head with threaded rod or cross bolts as shown in figures 6.3 and 6.4. Allow one pipe diameter between the cross bolt centrelines and off set by 90 degrees. Contact our Technical Services Call Centre on 0800 800 262 for more information.



Figure 6.3 Typical DN150 Internal Pull Head



Figure 6.4 Typical DN300 External 'Cone Style' Pull Head

SECTION 6

GENERAL INSTALLATION GUIDELINES

IPLEX RESTRAIN® BOREHOLE & DRILL MUD

The borehole dimensions vary depending upon the installation methodology being used, native soil type, additives used to produce drilling mud, drill mud viscosity, reamer type/style and pipe diameter. The contractor or driller is responsible for determining their borehole diameter and drill mud type before drilling commences. Drill mud is an important component of successful installations. (See figure 6.5.) It is used to stabilise the borehole, assist in the cutting process, cool down the transmitter, carry spoil out of the borehole and lubricate the borehole for reducing the frictional resistance of the product being pulled into the borehole.



Figure 6.5 Typical free flowing drill mud/lubricant

Tensile & Compressive Loads

Restrain® Sewer Pipe is able to be pushed or pulled through a borehole or host pipe. The threaded spigot and socket provides axial restraint capability. **Do not exceed** the maximum allowable axial load parameters shown in Table 5.

Table 5

Maximum Allowable Axial Load

PIPE DN	SN	MAXIMUM ALLOWABLE AXIAL LOAD			
		TENSILE		COMPRESSION	
		(KN)	(KG)	(KN)	(KG)
100	16	17.6	1800	17.6	1800
150	16	34.3	3500	29.4	3000
225	16	93.2	9500	93.2	9500
300	16	117.7	12,000	117.7	12,000

Radius of Curvature

Restrain® Sewer Pipe must be axially aligned with the host hole or host pipe at the point of entry. Some curvature back from the host hole/pipe is permitted.

The minimum radius of curvature is based on 300 x outside diameter as detailed in Table 6.

Table 6

PIPE DN	PIPE OD (MM)	MINIMUM RADII OF CURVATURE (M)
100	110	33
150	160	48
225	250	75
300	315	94.5

SECTION 6

GENERAL INSTALLATION GUIDELINES

IPLEX RESTRAIN® INSTALLATION STEPS

Step 1

Place a temporary wind up or pneumatic test plug inside the socket end of the first Restrain® pipe being installed. This prevents the new Restrain® pipe barrel from being invaded by drill mud or ground water, allowing easier assembly during joining.



Step 2

Unpack and thoroughly inspect all Restrain® Sewer Pipes to ensure the threads, seal rings and the joint assemblies are clean, undamaged and free of dirt or grit before beginning assembly.



Step 3

Place the seal ring in the groove (the last groove from the end of the pipe). The crown of the seal ring must be facing outwards. Carefully stretch the seal ring into the seal ring groove, tensioning the seal ring as you go by running your finger between the seal ring and the pipe in a circular motion around the pipes spigot/ seal ring groove.



SECTION 6

GENERAL INSTALLATION GUIDELINES

IPLEX RESTRAIN® INSTALLATION STEPS

Step 4

Lubricate the **spigot thread**, the **seal ring**, the **socket thread** and the **lead into** the socket.



Step 5

Align the clean spigot with the socket in a straight line. Ensure there is a smooth initial engagement. Do not cross thread. Use temporary support blocks if required



Step 6

Align thread start arrows and initially turn the spigot by hand in a clock-wise direction to engage the first few threads. Ensure the pipe barrel is supported. The first thread engagement and the first few turns should be smooth and free of "binding."



SECTION 6

GENERAL INSTALLATION GUIDELINES

IPLEX RESTRAIN® INSTALLATION STEPS

Step 7

Continue to hand screw the spigot into the socket as far as it will easily go, or up to where seal ring engages into the socket.



Step 8

Apply the strap wrenches to both the spigot and socket and screw up pipe until the seal ring completely disappears up into the mouth of the socket and the joint firmly resists further tightening.

Do not overtighten



Step 9

Completed Restrain® joint assembly with seal ring and spigot end, machine mark not visible.



Note: A Restrain® “C Wrench” assembly tool may be required for DN300 Restrain® Sewer Pipe due to the higher rotational forces required. The Restrain® “C Wrench” is sometimes useful when working in confined spaces or between trench shields.



SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® HORIZONTAL DIRECTIONAL DRILLING (HDD)

Restrain® has been installed in many locations throughout New Zealand. Typical drill shots of 80 to 100m are common with the longest known drill-shot to be 190m completed in one continuous pull-back. Restrain® Pipe lengths vary depending upon geography, native soils, site layout and installation pit or manhole/chamber dimensions. Drillers have installed Restrain® Sewer Pipe in lengths from 1m to 3 metres.



Figure 7.1 Typical cartridge style HDD pull-back.

Step 1

Before you arrive on site, determine the dimensions of your installation pit then order Restrain® Sewer Pipe to suit your installation methodology. This may result in the selection of 3m pipe-lengths for a normal cartridge style HDD installation or you may choose 1m lengths if you plan to drill to a new or existing manhole structure, completing pipe jointing within tight confined spaces. Some HDD operators order their pipe made to the same length as their HDD drill rods (usually 3.6m), this allows jointing to occur during drill rod changes and reduces your work site foot print, as a pipe-string above ground is not required with Restrain® pipes.

Step 2

Ensure tools and equipment are available, as detailed in section 6.

Step 3

Once on site, excavate installation pits. Ensure the installation pits are 1-2 pipe diameters below the new pipe invert.



Figure 7.2 Typical HDD cartridge style pull-back within a 1.8m diameter x 4.5m deep manhole structure installing DN300 x 1m Restrain® Sewer Pipe.

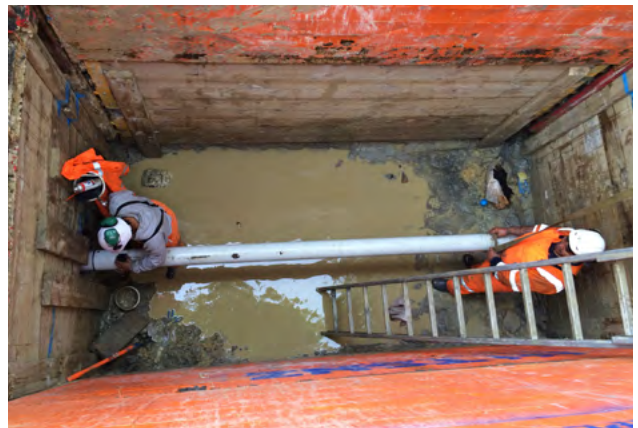


Figure 7.3 Typical HDD cartridge style pull-back within trench shields, 7m deep. DN150 x 3m Restrain®.



Figure 7.4 Typical HDD cartridge style pull-back between trench shields at a depth of 4.5m. DN150 x 3m Restrain®.

SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® HORIZONTAL DIRECTIONAL DRILLING (HDD)

Step 4

Select a reamer style/type to suit your native soils, drill mud type/viscosity and Restrain® Sewer Pipe outside diameter. Recommended minimum reamer diameter guidelines are listed below in Table 7.

Table 7

PIPE DIAMETER	REAMED DIAMETER
DN100 & DN150	Pipe Diameter + 100mm
DN225 & DN300	Pipe Diameter x 1.5

The driller is responsible for selecting the borehole diameter and reamer type/size and drilling mud type or viscosity. Some typical reamer types are illustrated on the right.

Drilling fluids are an important component of the HDD process. They are used to stabilize the borehole, assist in the cutting process, cool down the transmitter, carry the excavated spoil out of the borehole, and lubricate the borehole for reducing frictional resistance of the product pipe.

Warning: If the HDD drill rig pressure gauge suddenly increases, cease pull back **IMMEDIATELY** to avoid hydro-lock, buckling of the pipe and/or other mechanical breakages.

Check water flow, drill mud flow, drill mud viscosity and or mix. Consider backing out the reamer and reversing the Restrain® jointing procedure. Check for borehole collapse. Proceed with precaution.

Step 5

Begin reaming or pull-back, follow the Restrain® joint assembly steps within Section 6.

Step 6

Connect new sewer laterals into Restrain® Sewer Pipe using a 3 way, plain ended PVC wye junction (Figure 7.5) or with a Quick Fit Saddle (Figure 7.6) Traditional PVC sewer / DWV fittings are used to complete the final connections.



Figure 7.5 Plain ended wye junction. Figure 7.6 Restrain® Quick Fit Saddle.

Typical Sand Reamers



Typical Clay Reamers



Typical Cobble Reamers



SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® PIPE BURSTING, STATIC & HYDRAULIC

Restrain® has been installed in many locations throughout New Zealand using Static/Hydraulic Bursting methods, typical burst lengths of 50 - 100m are common. Restrain® Pipe lengths may vary depending upon installation pit or manhole/chamber dimensions. One of the deepest installations was completed in Auckland city during 2011 where 750mm lengths of DN300 Restrain® Sewer Pipe were installed within existing 1050mm diameter concrete manhole structures at depths of up to 8m.



Figure 7.7 Typical Static Hydraulic Pipe Bursting installation DN225 x 3m Restrain® Sewer Pipe.

The largest PB-HY upsize completed in a single pass using Restrain® Sewer Pipe was completed with a TT (Tracto - Technik) 800g hydraulic PB rig, where existing DN150 steel reinforced concrete sewer pipe was upsized three sizes, pulling in DN300 Restrain® Sewer Pipe behind the bursting head.

Bursting mandrill types will vary depending upon the host pipe type that you intend to replace. When replacing traditional materials such as Concrete, Earthenware and AC, a bursting head as illustrated in Figure 7.10 is normally used. For Cast Iron and Polyethylene host pipe replacements a blade style mandrill is installed either on or leading the bursting head. (Figure 7.9) Steel pipe replacement requires extreme hydraulic forces with specialist roller or wheeled mandrills, leading the bursting head. (Figure 7.8)

Step 1

Before you arrive on site determine the dimensions of installation pit then order Restrain® Sewer Pipe to suit. This may result in the selection of pipe lengths measuring between 1m & 3m pipes for normal pipe-string or cartridge style pit to pit installations.

Step 2

Ensure tools and equipment are available, tools and equipment are detailed in Section 6.

Typical Pipe Burst Heads & Mandrills



Figure 7.8 Typical "steel wheel" or "blade" type bursting heads.



Figure 7.9 Typical External "Cone Style" Bursting Head. Upsize of existing 100mm CI pipe with new PVC pipe.



Figure 7.10 Typical External Bursting Head with DN300 Restrain® Starter Pipe.

SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® PIPE BURSTING, STATIC & HYDRAULIC

Step 3

On site, excavate installation pits and/or lateral connections. Ensure the installation and receiving pit depths are 1–2 pipe diameters below existing host pipe invert.

Step 4

Select a mandrill or expander to suit the existing host pipe material. Allow for over expansion for a successful pull in. Over expansion will vary depending upon factors including soil type, pipe diameter, pipeline length and tidal activity.

Do not exceed the maximum allowable axial load detailed in Table 5, Page 12.

Step 5

Attach your Restrain® socket starter pipe (refer Figure 7.13) to the pull head.

Step 6

In high water table applications, a wind-up test plug (refer Page 13) can be installed inside the socket end of your Restrain® lead pipe. This will prevent mud or ground water invading your new pipe.

Step 7

Begin pull back. Follow the Restrain® joint assembly steps in Section 6

Step 8

Sewer laterals can be replaced using Restrain® Sewer Pipe. 1m, 2m or 3m pipes are often used for the pull back. The Hammer Head PB-30 Static PB unit is ideal for installing Restrain® Sewer lateral pipe.

Step 9

Once your new Restrain® Sewer & lateral pipes are in place, connect sewer laterals using a 3 way, plain ended wye junction (Figure 7.5) or a Quick Fit Saddle (Figure 7.6 and 7.15.) Traditional PVC fittings are used to make the final connections.



Figure 7.11 Installation pit



Figure 7.12 Receiving pit



Figure 7.13 Pull Head with Restrain® Socket Starter Pipe attached



Figure 7.14 Receiving Pit with Hammer Head PB 30 Static pipe bursting unit.



Figure 7.15 Restrain® Sewer, Lateral Pipe & Quick Fit Saddle installed

SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® REAMING

Restrain® has been installed using reaming methods. Reaming or Pipe Eating uses a traditional HDD rig where the drill rods are inserted inside existing earthenware pipes. A reaming head is connected prior to the new Re-strain® Sewer Pipe. Typical reams between manholes of up to 100m have been completed. Restrain® Pipe lengths may vary however 3m lengths are most common.



Figure 7.7 Reaming or pipe eating using a traditional Horizontal directional drill, applied to a glazed earthenware Host.

Step 1

Before you arrive on site determine the dimensions of the installation pits then order Restrain® Sewer Pipe to suit installation pit dimensions. This may result in the selection of 3m pipe-lengths for a normal pipe-string or shorter lengths for a cartridge style deep pit ream.

Step 2

Once on site excavate entry pit, exit pit and a small pit at each house lateral connection. Ensure the entry and exit pit depths are 1-2 pipe diameters below the invert of the old host pipe.

Step 3

Introduce drill rods from a traditional HDD rig into the existing host pipe.



Step 4

Attach reaming head and Restrain® starter pipe using a swivel bearing.



Step 5

Follow the Joint assembly steps within section 6 of this manual.

Step 6

Proceed with the back reaming process pulling the new pipe into position.



Step 7

Connect existing house laterals using a 3 way, plain ended wye junction connecting into the main in place with traditional PVC slip couplers, bends and ceramic to PVC adapters if required.



SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® PILOT TUBE MICRO TUNNELLING & HORIZONTAL AUGER BORING

Pilot Tube Micro Tunnelling (PTMT) is a method of installing new pipes below ground, at depth, working with limited space, accurately installing a pipe behind a remotely controlled, steerable, guided auger boring machine. PTMT employs augers to transport the spoil out of the borehole and a guidance system.

Horizontal Auger Boring (HAB) when compared to PTMT, employs less complicated & less expensive equipment. HAB is widely used to install pipes and casings. Restrain® Sewer Pipe has been installed using both techniques, the installation method is similar for PTMT and HAB.

Step 1

Before you arrive on site, determine what length of Restrain® Sewer Pipe you will require. Pipe lengths are usually consistent with the length of the PTMT or HAB, auger casings.

Step 2

Ensure tools and equipment are available, as detailed in Section 6

Step 3

Attach your Restrain® socket starter pipe to the lead auger. (Figure 7.19). Insert auger sections inside the Restrain pipe sections (Figure 7.17)

Step 4

Begin pilot tube installation and MT the borehole. Add your next auger then follow the jointing procedure in Section 6, pushing Restrain® Sewer Pipe into place.

Warning: The amount of over cut required to carry out the MT process depends upon factors including the type of soil, lubrication, pipe size and line length, and is normally at least 20mm larger than the maximum pipe socket OD, or may be 30 to 50mm larger in rock or swelling clay.

Do not exceed the maximum allowable axial load detailed in Table 5, Page 12.



Figure 7.16 Typical Micro Tunnelling installation.



Figure 7.17 PTMT, DN225 x 2m Restrain® Sewer, Pipes with auger sections inserted.



Figure 7.18 PTMT using DN225 x 2m Restrain® Sewer Pipe. Installed at 0.04% grade.



Figure 7.19 Lead auger with Restrain short starter pipe attached

SECTION 7

SPECIALISED INSTALLATION GUIDELINES

IPLEX RESTRAIN® SLIP LINING



Figure 7.20 Typical Slip Lining installation using DN150 x 6m Restrain® Sewer Pipe, into a concrete Host.

Slip Lining (SL) is a method of installing a new pipe by inserting (or slipping) Restrain® Sewer Pipe inside a deteriorated host pipe. SL can be used to rehabilitate gravity sewer and stormwater pipelines however the decrease in the existing pipe's cross sectional area needs to be evaluated. Restrain® may provide a larger cross sectional area when compared with other thermoplastic pipe systems.

Step 1

Check alignment, establish if the grade of the host pipe provides suitable fall for your new Restrain® Sewer Pipe.

Step 2

Gain approval from the asset owner to ensure they are satisfied with the existing pipe-grade.

Step 3

Before you arrive on site determine what length of Restrain® Sewer Pipes are fit for use at the site. In most cases the contractor orders the longest pipe available, 3m lengths are common when installing via SL methods. Once pipe lengths are determined order Restrain® Sewer Pipe.

Step 4

Clean and prepare the host pipe for insertion.



Figure 7.21 Assembling Restrain® joint with strap wrench

Step 5

Ensure tools and equipment are available, as detailed in Section 6.

Step 6

Once on site, excavate entry and exit pits ensuring your work platform is free from ground water. Ensure the entry and receiving pits are 1-2 pipe diameters below the existing host pipe invert.

Step 7

A proving plug should be pulled through the existing host pipe to cross check a successful installation.

Step 8

Follow the Restrain joint assembly steps within Section 6.

Step 9

Push or pull your first Restrain® pipe into the host pipe.

Step 10

Stabilise your new pipe within the host pipe. For short SL installations, concrete anchor blocks are poured at the entry and receiving pits. For longer SL installations, grouting of the new pipe into the host pipe may be required. (Refer Section 4, Page 9.)

SECTION 8

FIELD TESTING

IPLEX RESTRAIN® FIELD TESTING

The Restrain® Sewer Pipe system may be field tested after installation, in accordance with the relevant parts of these industry Standards:

New Zealand Standard

NZS4404:2010 "Land Development and Subdivision Infrastructure", Appendix C2 "Non-pressure pipelines -field leakage testing", and Clause C2.2 "Hydrostatic Test".

Joint Australian / New Zealand Standards

AS/NZS2566.2 "Design of Buried Flexible Pipelines – Installation", Section 6 "Field testing", and Appendix N "Leakage testing for non-pressure pipelines"

AS/NZS2032 "Installation of PVC Pipe and Fittings", Section 7.3 "Testing of non-pressure pipelines"

For more information on field testing refer to <https://www.iplex.co.nz/assets/Uploads/Pipeline-Percy-How-I-Field-Test-PVC-Pipelines.pdf>



Figure 8.0 Field Testing. DN150 Restrain® Sewer Pipe.



SECTION 9

FREQUENTLY ASKED QUESTIONS

IPLEX RESTRAIN® FAQ's

Question 1

Can Restrain® sewer pipe be used with traditional PVC drain, waste & vent pipe and fittings?

Answer

Yes, Restrain® sewer pipe is fully compatible with PVC DWV pipe and fittings, manufactured to AS/NZS1260.

Question 2

How do I test Restrain® sewer pipe on site?

Answer

Restrain® sewer pipe is field tested using the same methods as traditional PVC pipe. Refer to Section 8.

Question 3

Can I use solvent cement DWV fittings on Restrain® sewer pipe?

Answer

Yes, Restrain® sewer pipe has the same outside diameter as traditional PVC DWV pipe, and can be used with PVC DWV fittings designed for solvent cement jointing. Remove the threaded Restrain® socket or spigot before assembling of the solvent cement joint.

Question 4

What type of lubricant do I use when jointing Restrain® sewer pipe?

Answer

We recommend CRC808 or Gensil 601 silicone spray lubricant.

Question 5

Why can't I use standard rubber ring pipe lubricant on Restrain®?

Answer

Standard pipe lubricant loses its slippery properties soon after the joint is made. Silicone lubricant remains slippery longer, which aids assembly of the Restrain® joint and may allow you to unscrew the threaded joint should the installation need changes.

Question 6

Why is a different pull head necessary?

Answer

Standard wind-up pull heads designed for PE pipe may not be suitable for Restrain®, as the internal engagement grooves may not "grip" effectively into the dense PVC surface. Cross-bolt style pull heads, for internal or external use, are recommended for Restrain® pipe, as shown in paragraph 7.3.

SECTION 10

IPLEX - BUSINESS QUALITY MANAGEMENT SYSTEMS

IPLEX® BUSINESS QUALITY MANAGEMENT SYSTEMS

Quality Assurance

Creating products of consistently high quality is at the forefront of the Iplex® manufacturing process, and central to the customer promise that Iplex® product quality meets or exceeds standards claimed.

All Iplex® manufacturing plants operate under a strict ISO 9001 Quality Management System (QMS). External certifying bodies carry out regular audits to provide third-party certification of the Company's QMS. Continued third-party product certification of Iplex® plastic pipeline products to relevant Australian & New Zealand standards, is also provided by these bodies.

The Iplex® mechanical testing laboratory in Palmerston North is an IANZ accredited facility, providing added assurance that any measurement and testing is carried out professionally and in a technically reliable manner in accordance with international standards.



APPLICABLE STANDARD	LICENCE TYPE	LICENCE NUMBER	CONFORMITY ASSESSMENT BODY
ISO 9001:2015	QMS Accreditation	QEC4169	SAI Global
ISO/IEC 17025:2017	IANZ Accreditation	ACCREDITATION NUMBER 61	IANZ
BEST ENVIRONMENTAL PRACTICE-PVC	BEP-PVC	BEP-PVC-0067	ApprovalMark International
AS/NZS 1254:2010	StandardsMark™	SMKP20126 & SMKP20180	SAI Global
AS/NZS 1260:2017	StandardsMark™	SMKP20184, SMKP20185 & SMK1305	SAI Global
AS/NZS 1260:2017	WaterMark	WM 74530	ApprovalMark International
AS/NZS 1477:2017	StandardsMark™	SMK02569 & SMKP20181	SAI Global
AS/NZS 1477:2017	WaterMark	WM 74868	ApprovalMark International
AS/NZS 4130:2018	StandardsMark™	SMKP20400	SAI Global
AS/NZS 4130:2018	ISO Type 5	AMI 74891	ApprovalMark International
AS/NZS 4441:2017	StandardsMark™	SMKP20682	SAI Global
AS/NZS 4765:2017	StandardsMark™	SMK02570	SAI Global
AS/NZS 61386.21:2015	S-Mark	LIC 2901 & LIC 2910	Bureau Veritas

SECTION 11

IPLEX PIPELINES – THE COMPANY

IPLEX® PIPELINES NZ THE COMPANY

Iplex® is one of New Zealand's leading manufacturers and suppliers of plastic pipeline systems. Iplex® provides products and services throughout New Zealand and to export markets around the Pacific and other international markets. Iplex® has manufacturing operations in Palmerston North, Christchurch and Ashburton, as well as access to the Iplex® Australia network.

Iplex® have been manufacturing plastic pipelines since 1938 and with over 80 years of industry service and technical experience, throughout Australasia.

Plumbing: The Iplex® plumbing sector covers pipes and fittings used within the property boundary. This includes reticulation of potable and non-potable water, sanitary plumbing, wastewater, drainage and gas reticulation. Iplex® have the capabilities of supplying drain, waste and vent pipes and fittings, rainwater systems, traps and accessories.

Civil: Iplex® provides a wide range of solutions for wastewater, drainage and potable water pipeline projects. Manufacturing both PE (Polyethylene) & PVC (Polyvinylchloride) for both pressure and non-pressure (gravity fed) pipeline systems including civil infrastructure, drainage systems and roading systems.

Iplex® also services the following industry sectors:

Energy and Communications: an important sector for Iplex® NZ and there is a wide range of conduits, ducts and fittings available for new development and maintenance projects. The range covers electrical, communication and gas.

Rural: Iplex® also service the rural market providing pipes and fittings for rural use. Iplex® provide systems for irrigation, stock water, land drainage, culverts and farm dairy effluent.



Iplex Pipelines manufacturing plant and distribution hub in Palmerston North, New Zealand

IPLEX RESTRAIN® DESIGN & INSTALLATION GUIDE

APRIL 2023

LIMITATIONS

The information contained in this document is current as at April 2023 and is based on data available to Iplex® Pipelines NZ Ltd at the time of going to print.

All photographic images are intended to provide a general impression only, and should not be relied upon as an accurate example of Iplex® Pipelines NZ Ltd products, installed in accordance with this document or the referenced compliance documents.

This publication replaces all previous editions of the Restrain® Design & Installation Guide. Iplex® Pipelines NZ Ltd reserves the right to change the information contained in this document without prior notice. It is your responsibility to ensure that you have the most up to date information available. You can call toll free on 0800 800 262 or visit www.iplex.co.nz to obtain current information.

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