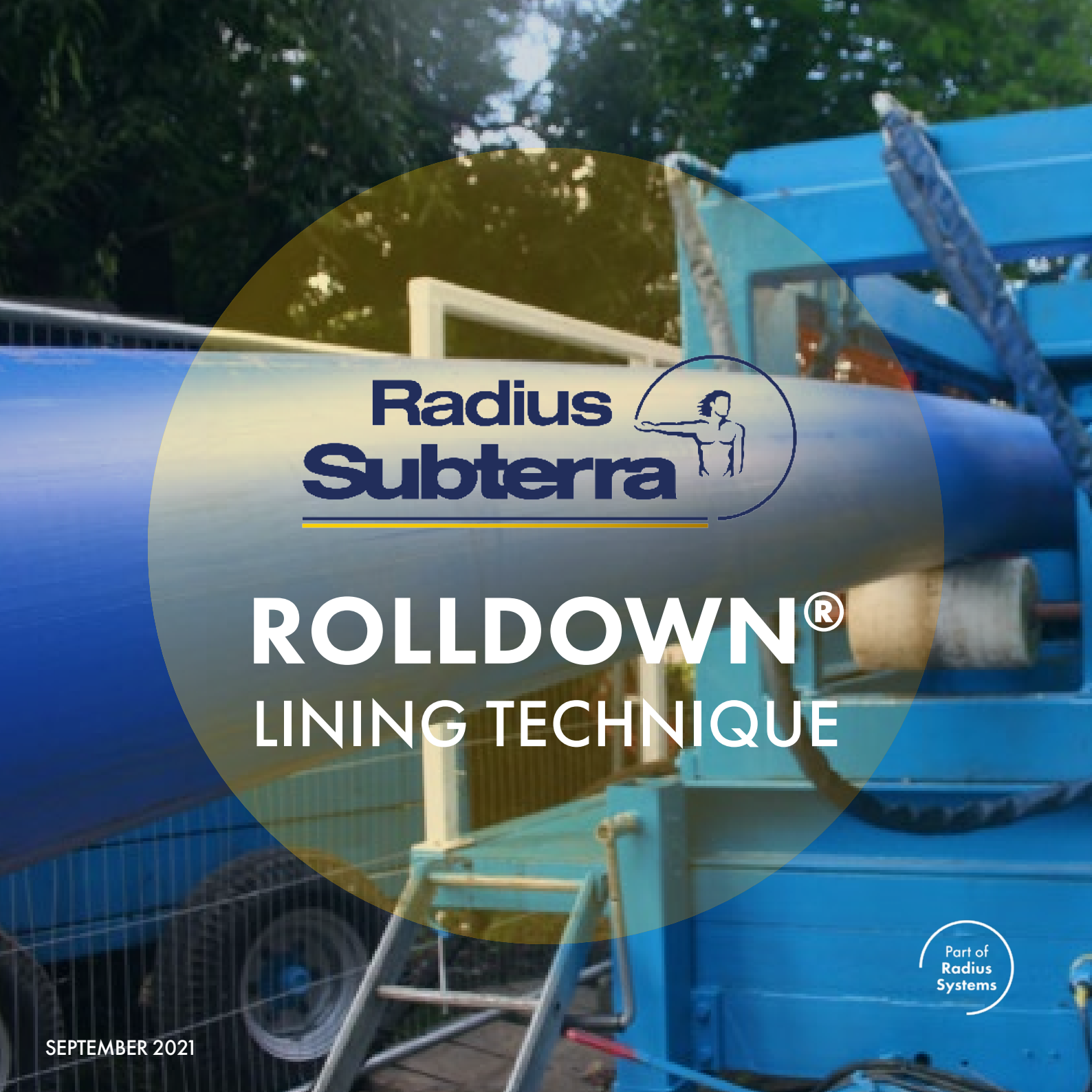

Radius Subterra

ROLLDOWN®
LINING TECHNIQUE

Part of Radius Systems

SEPTEMBER 2021

What is Rolldown®?

A ground-breaking no-dig pipeline replacement technique, that uses fully structural or interactive close-fit polyethylene liners for the rehabilitation and protection of ageing pipelines.

The polyethylene pipe is pushed through a set of rollers to concentrically reduce its diameter by around 10% for easy insertion into the host main. Once installed, the PE pipe is pressurised to revert it to its original diameter, forming a close-fit within the main.

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Rolldown® range of applications

Host pipe nominal bore	SDR11	SDR 17	SDR21	SDR26	SDR33
104mm / 4"	✓	✓	X	X	X
110mm / 4"	✓	✓	X	X	X
125mm / 5"	✓	✓	X	X	X
155mm / 6"	✓	✓	✓	✓	X
160mm / 6"	✓	✓	✓	✓	X
180mm / 7"	✓	✓	✓	✓	X
200mm / 8"	✓	✓	✓	✓	X
205mm / 8"	✓	✓	✓	✓	X
213mm / 8"	✓	✓	✓	✓	X
225mm / 9"	✓	✓	✓	✓	X
250mm / 10"	✓	✓	✓	✓	X
260mm / 10"	✓	✓	✓	✓	X
268mm / 10"	✓	✓	✓	✓	X
302mm / 12"	✓	✓	✓	✓	✓
315mm / 12"	✓	✓	✓	✓	✓
355mm / 14"	✓	✓	✓	✓	✓
400mm / 16"	✓	✓	✓	✓	✓
450mm / 18"	✓	✓	✓	✓	✓
469mm / 18"	✓	✓	✓	✓	✓
500mm / 20"	✓	✓	✓	✓	✓

System features and benefits.

Features	Benefits
Pipe rehabilitation process	• Utilises existing pipeline asset as a conduit
Minimum dig process	• Minimum disturbance of adjacent services and structures. • Minimises the requirement for imported natural fill materials to reinstate excavations. • Reduces disposal of excavated material to landfill. • Small site footprint. • Less environmental and social disruption compared with open-cut pipe replacement.
Liner pipe made from standard PE resins	• Uses materials already approved for potable water or gas applications. • Standard PE pipe resins generally already well characterised and manufactured under a formal QA scheme.
Rolled-down and reverted pipe meets the specification requirements for virgin pipe materials	• Rolled-down and reverted PE pipe is effectively a new pipe installation.
Structural or semi-structural PE liner	• The structural liner is effectively a new pipeline installation. Semi-structural applications minimise liner material usage, cost and maximise free bore of relined pipeline.
Close-fit liner	• Maximises flow capacity. • No grouting required.
Smooth liner bore	• Maximises flow capacity.
Simple process equipment	• Available for PE diameters 100mm to 500mm.
Ambient temperature process	• No heating required.
Liner pipe pushed through Rolldown® machine	• Very small liner elongation during processing (≤3%)

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Features	Benefits
Diametrical reductions of ~10% (dependent on process details)	• Easy insertion into host pipe • May negotiate bends up to 11.25^0
Reduced diameter normally held indefinitely until reversion is carried out.	• No external mechanical restraint needed to maintain reduced size. • Insertion is effectively a sliplining operation • Insertion winching loads required only to overcome friction between liner and host pipe. • Process can be stopped / started without detriment.
Low installation winching loads	• Maximises insertion lengths (single pulls of up to 800m have been achieved) • Minimises liner elongation/residual tensile stresses after installation.
Installation stop/start capability	• On-site operational flexibility and convenience.
Reversion to close-fit with host pipe using water at ambient temperature.	• Simple reversion procedure. • No process heating/pipe shape re-forming requirements.
Rolled-down PE pipe can be butt-fusion joined without detriment to PE material / reversion characteristics.	• Flexibility in operation.
Full structural liners can utilise standard fusion or mechanical fitting technologies (subject to size availability)	• Using the same pipeline fittings or ancillaries as for standard PE pressure pipe systems.

Projects

	Client	Location	Pipe size	Project length
Water	South East Water	Hindhead	160mm SDR17	900m
	Tronox	Grimsby	400mm SDR17	400m
	Severn Trent Water	Leicester	500mm SDR21	1100m
	Severn Trent Water	Stafford	315mm SDR21	200m
	Southern Water	East Grinstead	500mm SDR26	200m

	Client	Location	Pipe size	Project length
Gas	Northern Gas Networks	Castleford	450mm SDR21	450m
	Southern Gas Networks	Didcot	315mm SDR21	1000m
	Northern Gas Networks	Keighley	155mm SDR21	250m

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The facts

The first PE gas pipe was installed in the UK over 50 years ago, and at the time PE pipes had a guaranteed lifetime of 50 years. Today, the pipeline is structurally sound and still in service, running at a medium pressure of 2 bar.

- We have rehabilitated over 5,000 km of pipelines in the last 35 years, using Rolldown® and Subline®.
- Today, modern PE pipes have a minimum lifetime of 100+ years.
- All new pipes are approved to either GIS PL2 and EN1555 for gas or EN 12201 for water.
- Rolldown® can be used on pipes from 100mm to 500mm with a minimum SDR of 11.
- We are not only the installer of the Rolldown® system, but we are also the pipe supplier, which means that we can offer a cradle to grave approach.
- Rolldown® is used with standard PE resins and SDRs across the full range.
- The Rolldown® technique uses no-dig installation to insert the pipe liner.
- The installation site uses a small footprint area.
- The technique uses butt-fusion welding and as is normal practice, the pipe has to be debeaded.
- PE pipes are butt-welded together into a long string to facilitate installation. The string length will depend on site restrictions.
- Rolldown® cannot negotiate sharp bends. These need to be removed before installation of the pipe.
- We recommend that CCTV inspection of the main is carried out before using Rolldown® to check the location of bends and service connections. Obstructions will need to be removed before pipe liner installation.
- With good planning, pipe lengths can be joined while the Rolldown® process is underway, as this can only be carried out within a short time window. This is not standard practice and we do not recommend it. However, it can be used in a last resort situation.
- We have a full range of service and branch saddle connections available that are sized to fit rolled-down pipe. Standard fittings that are stocked at your stores are used to carry out connections to the pipe liner.
- We have developed a factory rolled-down pipe coil for the Gas Distribution Network NGN under NIA funding, to speed up the Rolldown® installation process. We applied the Rolldown® process to the standard PE pipe manufactured at our factory. The rolled-down pipe coil was delivered to site and inserted into the host main which needed replacing, bringing installation time and cost savings.

FAQs

Can you use factory rolled-down for all PE pipes?

No, we would require a minimum order quantity, of at least 6 km to make factory rolled-down pipe. Factory rolled-down coils can be made on PE pipes up to 160 mm.

Why should we look at using Rolldown® and when?

When the host pipe is no longer fit for service, has no or very little structural strength left, or it has come to the end of its service life or is badly corroded. But these pipes can still be used as an access point to insert a standalone pressure bearing pipeline using Rolldown®. These rolled-down pipes also have the ability to cope with gap spanning, hole and axial cracking within the host main. They also restore the structural strength of the host main and as the liner is a PE pipe, they offer a smooth bore, restoring maximum flow capacity within the main.

How does the liner deal with pipe bore variation? Does it rely on being expanded by the pressure to maintain a close-fit? What happens in vacuum conditions?

The pipe diameter is reduced by around 10% before it is inserted in the host main. We then fill the pipe with water under pressure, which expands the pipe to form a close-fit against the host. During expansion, bore variations are accounted for and the pipe does not need to be under pressure to maintain a close-fit.

What method do you use for cleaning the main and do you do any condition assessment prior to lining?

See the latest Water Industry Standard & Information & Guidance Note documents for details of cleaning methods. Condition assessment should be carried out by the asset owner/contractor. But if required we can clean the mains as part of our operation.

What is the largest pipe diameter and longest pull length undertaken using Rolldown®? Do winch loads increase significantly with this technique?

The largest PE pipe liner installed using Rolldown® is 500 mm, with the longest pull length being 800m to date. Winch loads would be determined by the pipe size and topography, but would not significantly increase load on the winch.

Does rolling the pipe down put too much stress onto the PE pipe?

PE possesses memory properties and PE pipes will change shape when force is applied to the material and will return to its original shape, when the external force is removed and internal pressure is applied.

When should we look to use this technique?

The Rolldown® technique is ideal for problematic mains, when replacement using open cut is not possible.
As a no-dig installation technique, it is ideal for pipelines running under lakes, rivers or environmentally sensitive areas.

What pressure is required to revert the PE pipe liner back to its original diameter?

This is dependent on the SDR of the installed liner and the ambient temperature. In most cases only 20 bar pressure is required.

How long does it take to revert the PE liner to its original diameter?

This will depend on the pipe length, temperature, diameter and SDR. We can provide information based on details supplied.

What do you use to revert the pipe liner? Is it water? If so, who supplies the water?

Yes, we use water at ambient temperature for the reversion process. If required, we can supply and dispose of the water after the operation.

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