

# Learnings from Yorkshire Water on Spray Lining

## Background

- Yorkshire Water has been relining water pipes to improve water quality since the 1960s using cement mortar liners and more recently (from 2006) using polymeric spray liners.
- On average, over the last 6 years, approximately 500m per week of spray lining has been completed.
- More recently a spray lining product made by 3M was discontinued. Yorkshire Water are moving to use a Radius product FLP2, once it has passed the accreditation requirements.

## Q & A

### **Q. What is the driver for lining, e.g. leaks, water quality?**

**A.** Yorkshire Water is using semi-structural lining to help reduce the burst rate, reduce leakage levels, reduce the carbon footprint associated with capital schemes, and to increase financial efficiency.

### **Q. How do you choose to line a water main vs replace it?**

**A.** This process is in development. There has been a product change following the discontinuation of 3M liners and the new product (FLP2) is currently going through the accreditation process. In general, it is expected that spray lining will be most beneficial where there are longer lengths of pipe that have clusters of failures.

### **Q. What quality control / quality assurance do you do?**

**A.** The quality control is built into the lining rig. It measures a number of different variables including temperature, lining thickness, mix ratios, lining speed, flow rate, pressure, distance lined and duration. The main QA is a CCTV of the main before and after the lining. Pressure testing is not undertaken due to the service connections (a pressure test may cause a leak/burst on the service connections which have not been replaced). Following the works they monitor for leaks.

### **Q. Do any of the lines get rejected following QA / How do you deal with any defects?**

**A.** From the CCTV a section that does not meet quality requirements can be identified (a document was developed for this to identify defects). As the defect usually occurs in an isolated section, these sections are cut out and replaced. Note that this is a small percentage of the overall works. In general these defects are caused by two issues: a pipe



section that was not suitable for lining (too degraded), or operator error, e.g. misaligned spray head.

**Q. What improvement has been found following lining?**

**A.** A small zone was fully lined and leaks monitored. The only leaks found in the last 5 years has been on service lines, i.e. not on lined pipes.

**Q. Are there particular requirements for cutting into the lined pipe for a repair or new tapping?**

**A.** Yes, most of these are related to not heating the liner up. A data sheet is available with additional details.

**Q. What fittings are required following a cut out?**

**A.** Generally use a gibault to connect the new section of pipe to the lined pipe.

**Q. Is there any requirement to treat the cut ends of the pipe in some way?**

**A.** It is possible to paint the end of the cut pipe if this is a concern, however this is not done at Yorkshire Water.

**Q. What is the size of the program at Yorkshire Water?**

**A.** The structural mains renal program is approximately £14 million (AUD \$25 million) annually. It is expected that a third to a half of the program will be spray lining.

**Q. What thickness of liner is used?**

**A.** The minimum thickness is 2.7mm and this is the most commonly applied thickness. It is applied in one pass. It is also possible to program the machine to apply a greater thickness at the joints if required.

**Q. How effective is the spray liner at sealing pipe joints?**

**A.** If a thick lining is applied (2.7mm or more) and it is a good tight joint then it will be covered by the spray liner. If there is a gap at the joint it will generally not be covered. However, this does not generally cause problems, possibly because the pipes overlap at the joint, providing an area twice as thick as the rest of the pipeline. Generally, in each water main there will be a mix of tight joints and joints with gaps.

**Q. How long does the process take?**

**A.** The area is prepared prior to the day for lining to keep water shut off times to a minimum. On the day of the lining the process is cut-in, clean, reinstall water supply, dry pipe, pre-CCTV, lining, post-CCTV and chlorination (spray on chlorine system used to save time and water). One machine is generally able to achieve 500m/week and a good day will see two linings in one day.

**Q. How long has the spray chlorination system been in use for?**

**A.** The disinfection system (steri-klenze) has been used for around 15 years.





**Q. How does the installation time compare to installing a new pipeline?**

**A.** Can generally line 120m/day in a built up area, perhaps up to 180m on a trunk main. The average installation is approx. 500m/w. This compares with approx. 150m per week for a new pipe installation. Time and cost is also saved by reducing restoration/reinstatement and avoiding other services.

**Q. How does the cost compare to installing a new pipeline?**

**A.** Approximately half the cost of a new main.

**Q. What is the expected liner/pipe composite life span?**

**A.** Although difficult to quantify, Yorkshire Water have assumed 50 years in our deterioration modelling. Noting that the liner helps to stop/delay internal pipe corrosion, but cannot prevent external pipe corrosion.

**Q. Do you experience any blockages to service connections following lining?**

**A.** Generally connections are 13mm (half-inch) and do not block. Occasionally a blockage or partial blockage will occur, in these cases it can be fixed by either dig-and-repair or using a robotic cutter (>DN150 only). Note: Tests in Australia with 19mm service connections did not result in any blockages, this suggests a low blockage rate is a reasonable assumption.

**Q. Can the product be applied to a wet surface?**

**A.** If lining over cement mortar lining then a damp surface is preferable, no standing water can be present.

**Q. How does the liner respond to pipe movement?**

**A.** The liner can handle some movement, but it is important to reduce pipe movement prior to lining if this is a known issue.

## Additional Resources

- Information on new service connections – attached.
- Information on spray chlorination system – [link to Schur website](#).



# Radius Subterra ‘SUBCOTE FLPII’

## Technical Bulletin

### Post-Lining Operations

### “Installing New Service Connections”

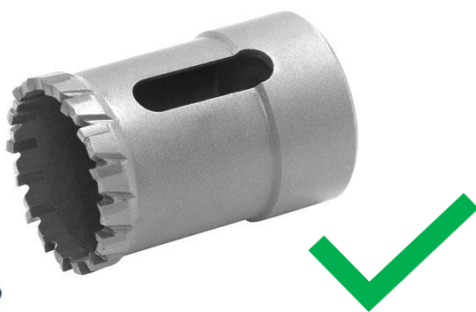
#### Introduction.

The ‘post lining’ installation of service connections will generally not adversely affect the long-term performance or integrity of the lining within the host pipe provided the following installation recommendations are followed:

- It is important that excessive downward pressure is not exerted when breaking through the ferrous host pipe wall. The tool should be allowed to ‘cut’ and not ‘punch’ through the applied lining. Doing so should minimise the risk of local deformation.
- New connections should be made on live (pressurised) mains using standard industry tapping machines (e.g. the Reed or Mueller series), The manufacturers operating instructions should be followed. Heavy duty ‘shell’ (hole saw) type cutters should be used.
- During drilling, the existing adhesion between the lining and the host pipe together with the internal water pressure will act upon the lining, allowing the cutter to neatly perforate the coating. Both the host pipe and the lining can then be tapped to accept the threaded connection.

#### Caution

The use of ‘drill point’ cutters may create excessive pressure on the lining resulting in localised deformation and potential de-bonding of the lining from the host pipe at the point of penetration. DO NOT USE ‘DRILL POINT’ CUTTERS.



#### Radius P

Radius House, Berristow Lane,  
South Normanton, Alfreton, Derbyshire, DE55 2JJ, UK

w: [www.radius-plus.co.uk](http://www.radius-plus.co.uk) t: +44 (0)1773 811112 f: +44 (0)1773 582489

Registration No: 1147475

