Cured In Place Pipe (CIPP)

Morrison Energy Services/ Cadent Lane Rental Industry Publication

TRANSPORT FOR LONDON

Introduction

In London, Cadent Gas is responsible for the gas network north of the city, which forms part of the wider Gas Distribution Network (GDN). Historically, cast iron mains were used, with the first being laid over a hundred years ago, but since the early 2000s, the industry has been replacing these aging pipes polyethylene (PE)

While a large proportion of the GDN has been replaced, there is still more to do, with Cadent undertaking 330 kilometres of replacement in London each year. Practices to carry this work out have improved in recent years with the introduction of the insertion method, however this reduces main capacity, and substantial road space required to store materials.

To improve this, alternative solutions were explored to enable increase longevity of the asset, maintain highway infrastructure, reduce gas escapes, and increase overall GDN performance /customer satisfaction.

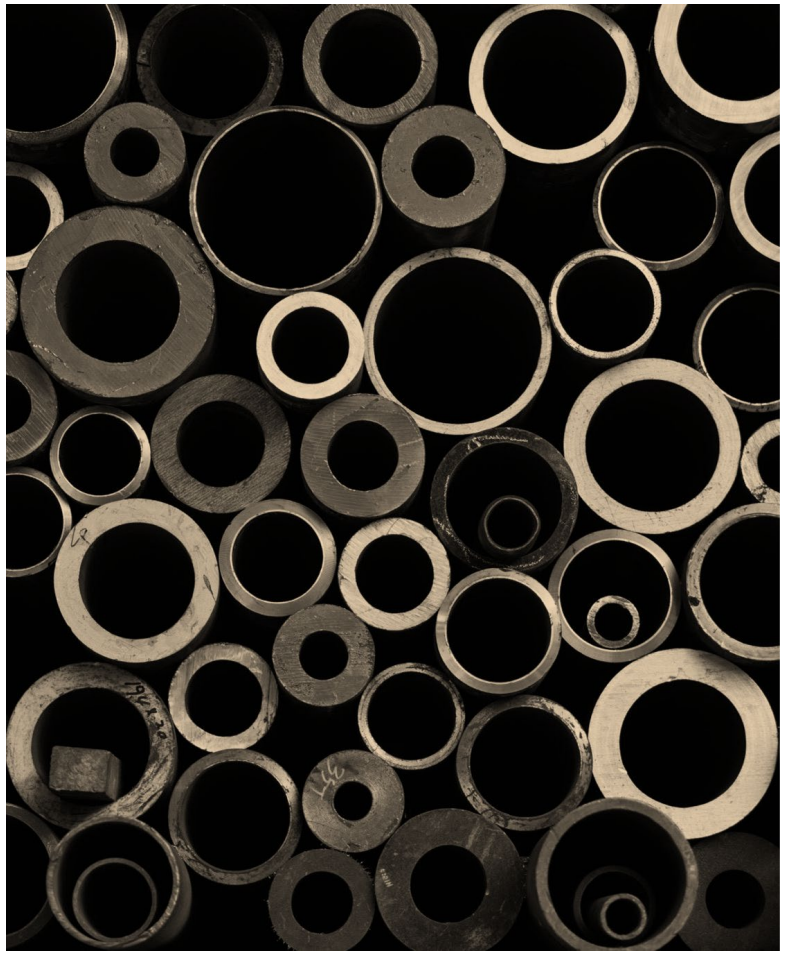
Based on the findings, a proposal was developed to explore the feasibility of a technology used within the water industry known as CIPP (Cured in Place Pipe). A soft tube liner is manufactured in sizes varying from 6”/150mm to 1.8m in diameter and installed by pulling it through the decommissioned gas pipe (rate. 1m/min). The liner is then inflated to take on the shape of its host and cured using ultra-violet light and timed based on calculations using the characteristics of the host pipe. Once ready, the liner is set permanently in place, increasing the longevity of the pipe for 70 plus years.

The Project

To test the effectiveness of the technology, it was trialled across a series of scenarios and pipe sizes, stretching over a length of 1.8km. A mix of 8” and 12” pipes were replaced utilising CIPP, incorporating connections to both polyethylene and metallic mains and multiple large diameter services. Stakeholder engagement was undertaken throughout, with representatives from the gas industry attending site.

Operational specifics, essential to mains replacement (i.e., method statements, risk assessments etc.), were first considered and temporary works procedures agreed, with installation, operation, and other bespoke procedure documents drafted. To optimise the outcomes of the first installation, cost benefit analysis was undertaken, providing ideal scenarios (8" and 12").

Data and material samples were collected throughout the project to qualify predicted outcomes. This included an independent assessment of both the carbon and environmental benefits, to establish comparison with alternatives.



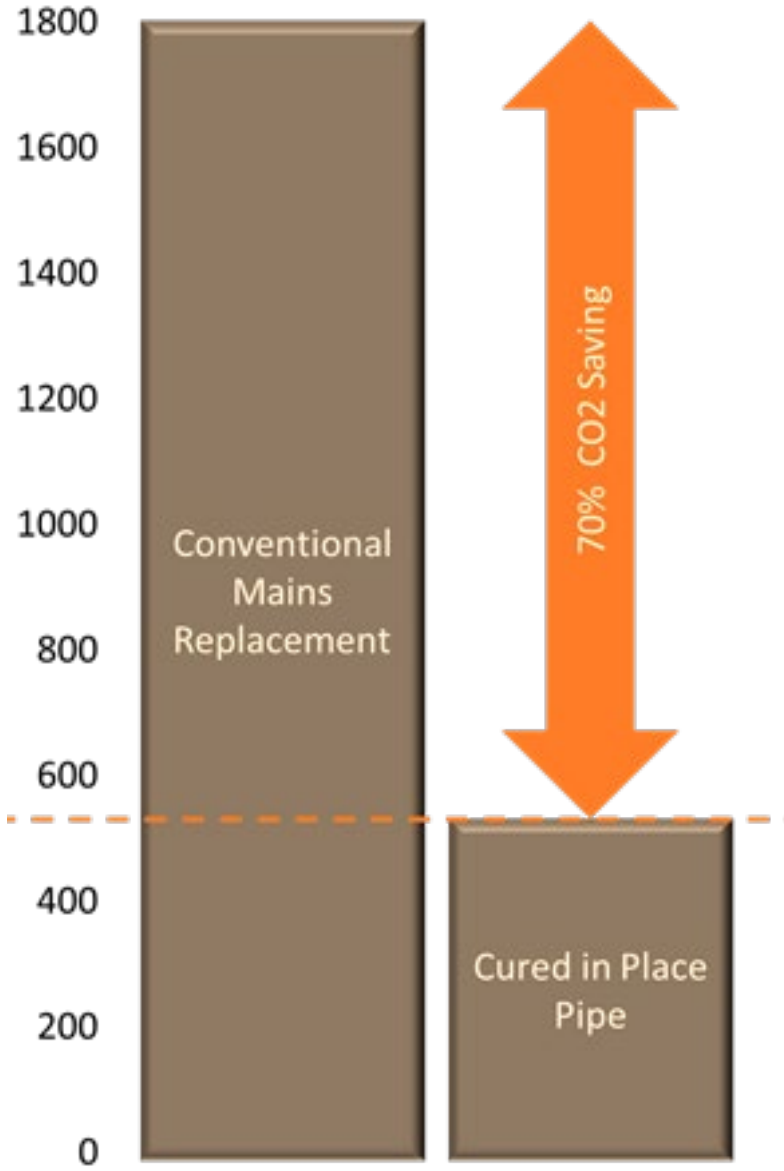
Outcomes

As CIPP replicates the shape of its host, findings proved capacity was not diminished, making it ideal for situations where the current supply must be maintained. Other benefits include:

- Reduced site footprint: the liner arriving in a small packing crate (2.5 x 1.2m). Excavation was also lessened.
- Quicker installation, reducing disruption to the travelling public
- Reduced CO2 production (70% less for 60m replaced when compared to open cut method)

During the trial, increased benefits were observed when the diameter of the host pipe were increased.

CIPP offers a more flexible approach to more challenging replacement scenarios, especially where the social cost of delay is heightened, and environmental factors require greater consideration. In these instances, CIPP is a lower cost and more technical solution, but less economical for typical replacement, where solutions such as PE provide greater benefit.



Lessons Learnt

To ensure the successful deployment of CIPP, it is essential to carry out camera surveys prior to replacement. This would help reduce unforeseen circumstances arising which could lead to complications during installation.

Training for specialist CIPP team to enable the installation of any end fittings would be advantageous, as one team could undertake the replacement from construction to completion, further reducing time on site and associated cost.

The technique is not currently suitable where domestic services are present in any volumes, as fitting development is required for pipes smaller than 12".

The project team will continue to work with the industry to advance the use of this technology and work with manufacturers to develop capabilities to reduce liner inflation and holding time, which could expedite delivery.

Conclusion

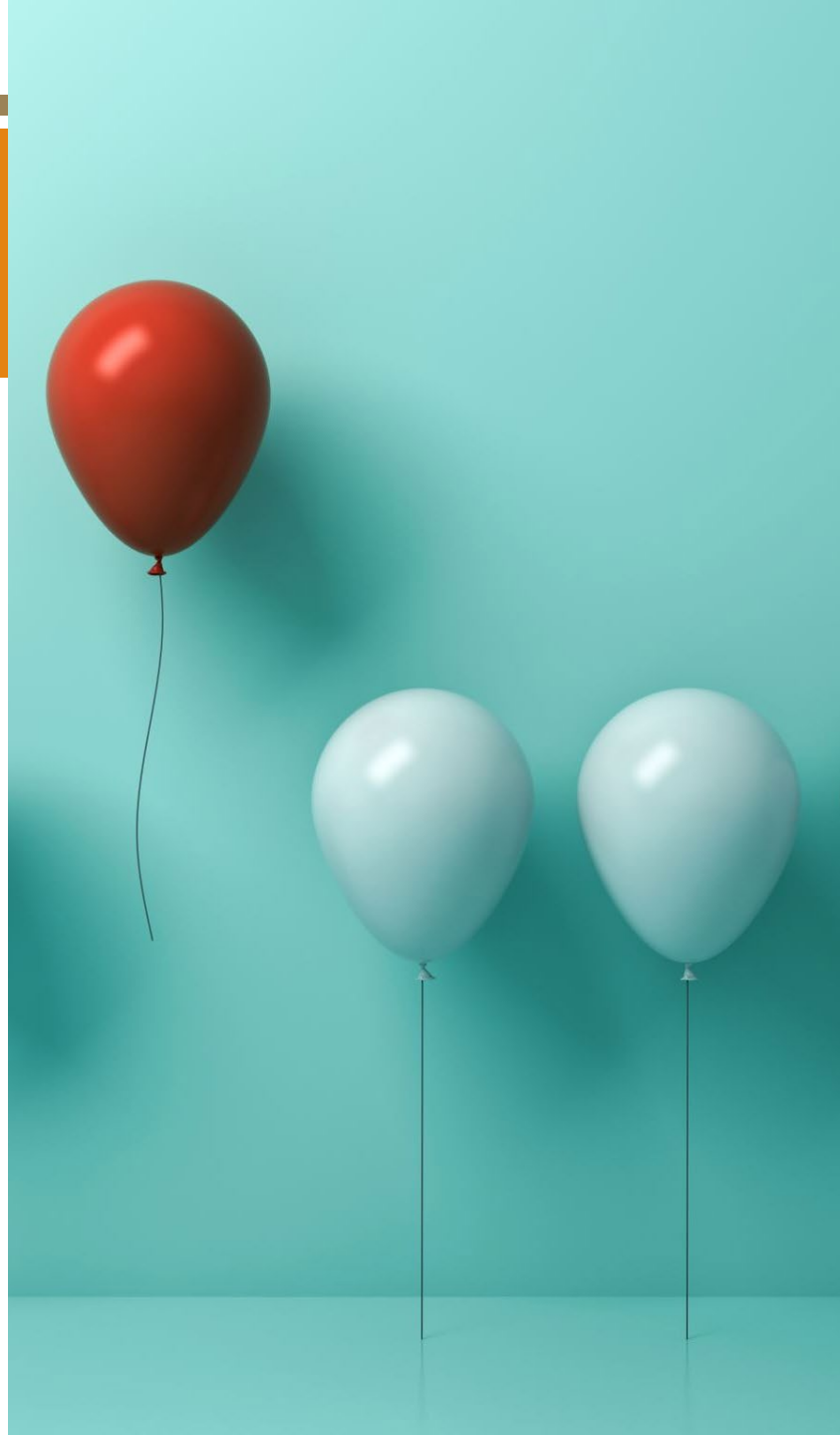
Currently using PE for mains replacement delivers an appropriate solution for many works. However, around 9% of works require a different solution like CIPP due to complexity or the need to maintain supply capacity.

The future aim of this project is to prioritise these challenging gas pipes, which make up 10% of the London GDN (32km/year), against the overall London target of 330km.

CIPP is a robust, permanent, and fully structural alternative for replacement, especially in areas or lengths with low or no domestic service density.

CIPP provides benefits in terms of reducing works duration and footprint in the public highway, which delivers time and costs savings associated with disruption. The technology also provides carbon savings and significant environmental improvements, which multiply when the size of the host pipe is increased.

Cadent will now look to further develop/embed CIPP within its mains replacement processes.



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