



Arundel Gate – Case Study

The UK's first installation of a CarboSeal® liner on a District Heating Network

Background

Project Value: £1.1million
Completion Date: September 2022
Location: Sheffield
Client: Veolia

CPC Civils were contracted by Veolia to renew 80m of District Heating pipework from Norfolk Street to Flat Street in Sheffield. The works were essential in maintaining the 44km long Sheffield District Energy Network that has been in operation since 1988.

The integrity of heat distribution pipes that carry pressurized hot water at 110°C, are key to ensure that the district heating scheme can deliver low carbon energy to the communities and businesses in the city.

Location

The site was located in Sheffield city centre part of the network for renewal routes under a main city bus route. Road closures in this location would have been highly disruptive to the council and the traditional open cut method of district heating installation would have been extremely disruptive to the public and the installation methodology would have been highly inefficient.

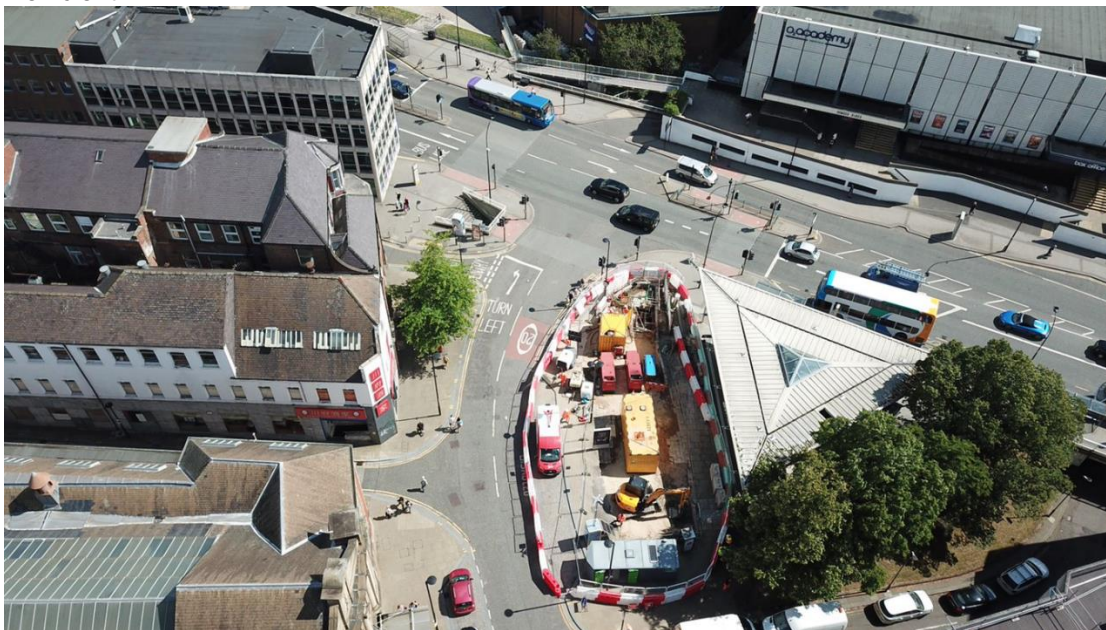


Figure 1 – Site Location Overview

Solution

Following extensive reviews with Veolia and design consultants, Synergi, a new product in the district heating market was perfect solution. The solution determined was to reline the pipework with a carbon fibre liner. CarboSeal® is a liner bespoke to district heating pipework that, once cured, has the exact expansion properties of steel and can withstand pressures >16bar. The liner has a lifespan in excess of the design life of traditional district heating pipes (25 years) and the liner can be installed in distances of up to 250m, negating the requirement for excavation across the highway. CPC Civils and Colus attended training at the CarboSeal® headquarters in Sweden in preparation for the first install of its kind on a district heating network in the UK.



Figure 2 – CarboSeal® liner.

Preparation Works

An existing chamber on Norfolk Street was utilised for access and a new chamber built on the Flat Street. To create access to the pipework, sections of the existing district heating network were removed. Two new 1m pieces of district heating pipe were welded onto the reception side of the liner to provide a perfect bonding surface.

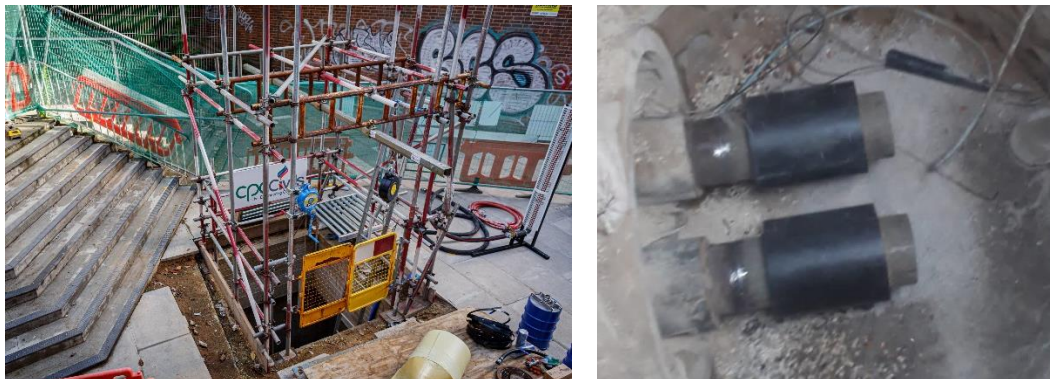


Figure 3 – New chamber installation on Flat Street and new 1m pieces of District Heating pipes installed on Norfolk Street.

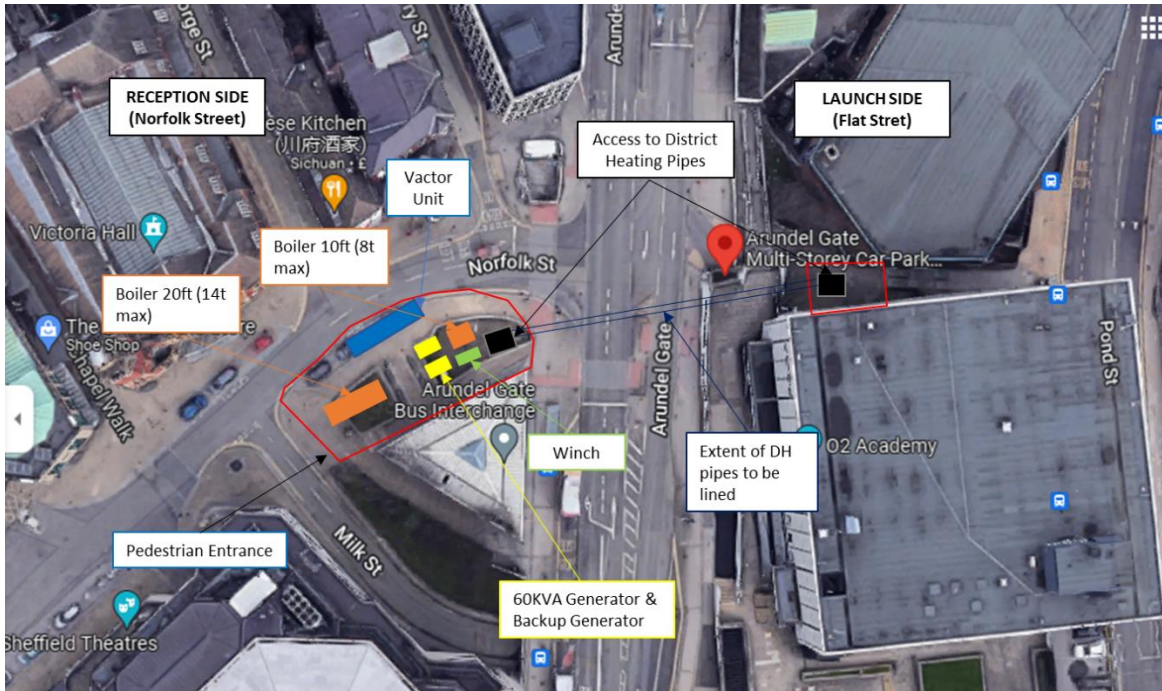


Figure 4 – Site layout.

Installation

A CCTV Survey was first undertaken on the pipe to determine its condition and suitability to accept the CarboSeal® liner.

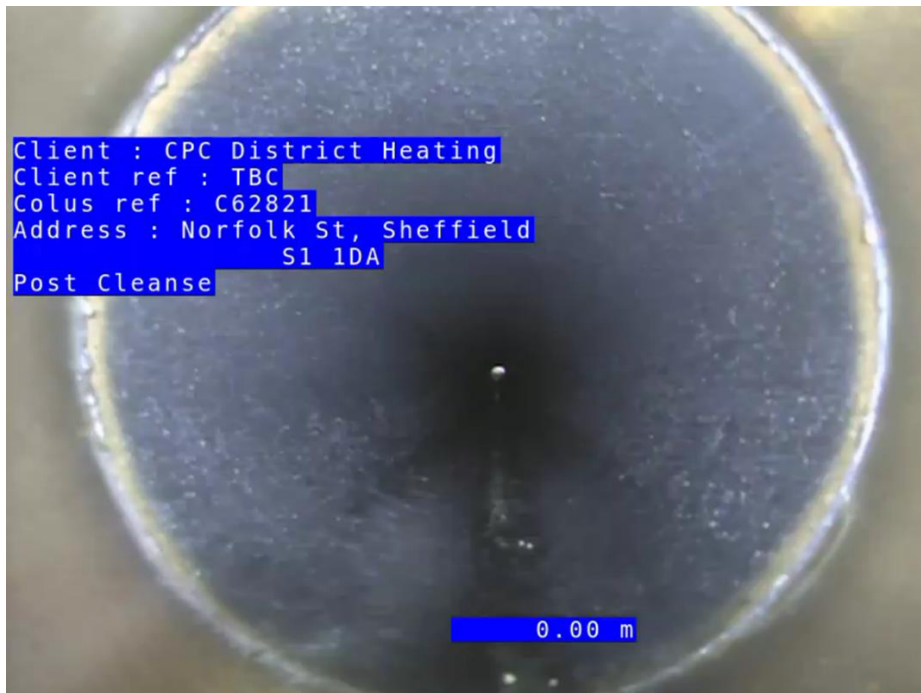


Figure 5 – Pre installation CCTV survey.

The liners were delivered in a frozen storage unit and upon arrival in the UK, stored at -25°C. Each liner was dwelled at 21.5°C in a temperature-controlled unit, 48 hours before it was to be installed.

The liner was carefully removed from the pallet and was first mounted onto the end cans and the burst bag installed.



Figure 6 – Mounting of liner and burst bag to end cans.

The liner was then winched into position before the second end can and burst bag were mounted.

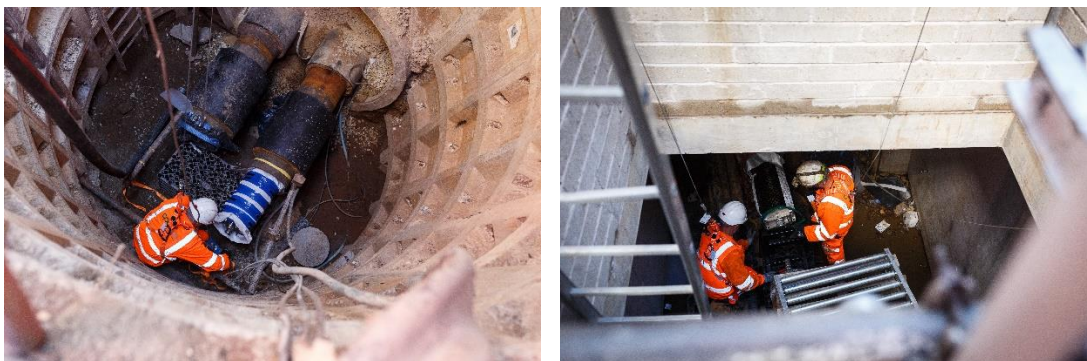


Figure 7 – Winching the liner and mounting the second end can.

The end cans were braced before the liner was pressurised to 0.2bar before the curing process began. Each liner was cured for 8 hours 30 minutes, in accordance with the graph below:

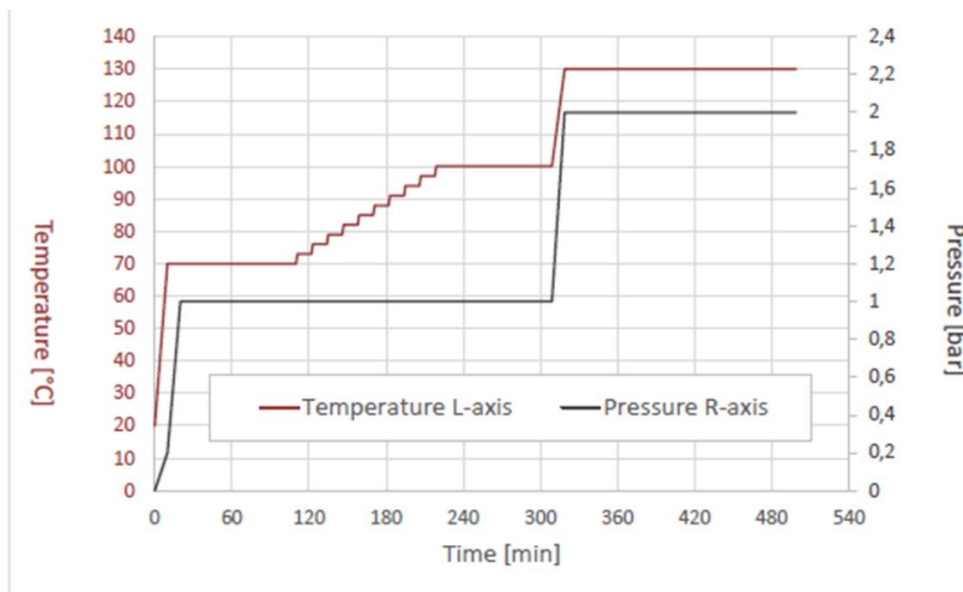


Figure 32: Steam process with stepwise temperature increase

Fig. 8 – Steam process curing graph

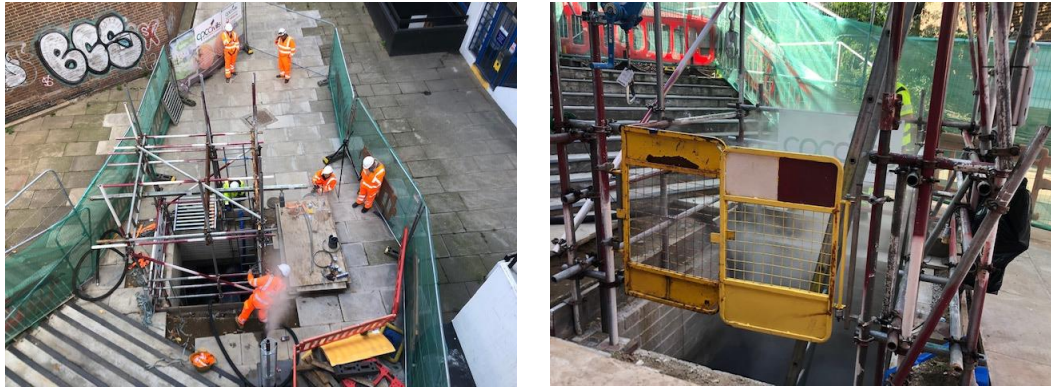


Figure 9 – Curing Process.

The end seals were then fitted and the final CCTV survey was undertaken. The district heating pipework was then reconnected.

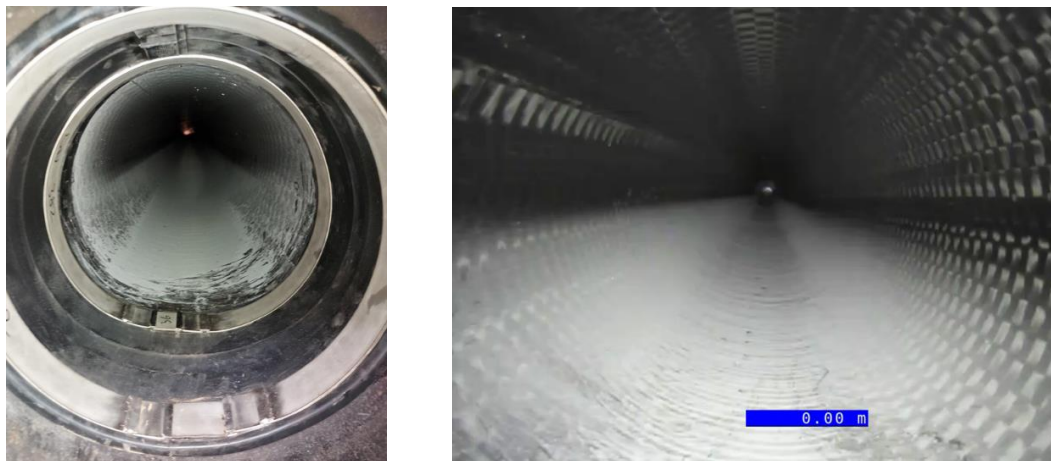


Figure 10 – End Seal Install & Final CCTV Survey.

Benefits

- Minimal excavation required to install the liner. A launch and reception pit are all that are required.
- No excessive welding or weak spots within the network.
- No disruption to roads with closures or complex traffic management requirements.
- Design life is in excess of steel pipes (approximately 35 years).
- Significant cost savings based on alternative methods.
- Fast install process meaning disruption to the network is greatly reduced.
- Reduction in heavy civil engineering can have up to an 80% reduction in CO2 emissions during the construction process.

Quality Assurance

CPC Civils have developed a full inspection and test plan for the works in line with our accredited ISO 9001:2015, 14001 and 18001 management system which has been approved by CarboSeal®.



Figure 11 – Site Set Up.



Figure 12 – Completion of the lining works and releasing of steam pressure.



Services

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www.cpccivils.net

Phone

0121 766 7019

Email

info@cpccivils.net

Address

11 Hockley Court,
2401 Stratford Road,
Hockley Heath,
Solihull,
B94 6NW