

DON'T SHIFT BRICKS – A HERITAGE ASSET UPGRADE

E. Cowey (AECOM)

ABSTRACT

Ehara taku toa i te toa takitahi engari he toa takitini. | Success is not that of the individual, but that of the multitude.

How do you install structural liners in 4.3 km of fragile brick barrel pipes, when the existing access structures are too small to fit the lining equipment? Collaboration between contractors and designers provided a creative, off-the-shelf solution for a bespoke challenge. This ensured that new manholes could be installed without causing brick barrel collapse during construction, as well as directing traffic loading off the brick prior to the lining works occurring.

In 2019, Dunedin City Council engaged the Ō3 Collective (Isaac Construction, Jasmax, and AECOM) to design and construct an upgraded streetscape within the central 'retail quarter' of George Street and surrounding blocks. In addition to above-ground amenity, the works include the renewal and upgrades of aged three waters infrastructure. Construction began late in 2021, and is anticipated to be finished in 2024.

Dunedin's central business district sits atop kilometers of egg-shaped, brick pipes conveying stormwater from the hillside to the ocean outfall. The brick barrels sit between 2 – 4 m depth to invert, and are either 900 mm high by 600 mm wide, or 1200 mm by 900 mm. These pipes were constructed in the 1870's and are therefore classified as heritage infrastructure. The most common defects pertain to the quality of lateral connections, however the residual mortar strength is variable after 150 years of service which has yielded locations with slipped bricks and similar localised defects.

Rehabilitation of the brick barrel stormwater mains was motivated by preserving heritage value, minimising environmental impact by reducing new materials and waste generated, and limiting construction / street closure timeframes. CIPP lining was the preferred rehabilitation method primarily due to its ability to conform to the egg-shaped host pipe.

To provide sufficient access for the the UV trains to cure the liner, the existing rectangular brick manholes were replaced with bespoke access structures. Collaborative design with the contractor yielded an economically feasible, repeatable solution protecting and strengthening the heritage brick barrel. Previous similar works had used bespoke precast arches, however this design utilised a traditional off-the-shelf manhole riser in a creative application.

A cast-insitu foundation at the springline of the brick barrel was designed to act as two independent halves on either side of the main. This foundation meant excavation was minimised around the brick barrel, which mitigated the risk of collapse. A traditional, pre-cast manhole riser with a semi-circular cored opening could then be positioned over the brick to transfer traffic loading to the aforementioned foundation. The skilled construction team successfully installed these structures while preventing damage to the brick and facilitating quality lining of the mains.

KEYWORDS

Sustainability, science & engineering, brick barrel, CIPP lining, heritage