

LoCem® +point®

Low carbon, geopolymer bed joint anode for sustainable enhanced service life of transitional steelframe buildings

Project Overview

C-Probe provided expert corrosion prevention knowledge and specialist materials to restore and preserve a Grade II listed building that had been lying vacant and derelict for many years. The project took place in 2015 at Terry's Chocolate Factory in York, UK which was facing severe structural degradation due to the ingress of moisture and water over its near 100-year life. Using cathodic protection technology to control and prevent future corrosion, the space was successfully regenerated into prestige apartments, increasing the service life to another 100+ years and the value of the asset to £50 million.

Project Aims:

- Undertake a more cost-effective restoration approach compared to traditional methods.
- Reduce the overall carbon footprint of the project, using smarter green materials and technology.
- Successfully control the repair and control the existing corrosion, whilst ensuring the building's service life was significantly enhanced.
- To be able to control and monitor the installed ICCP system for sustainable and successful service life tracking.



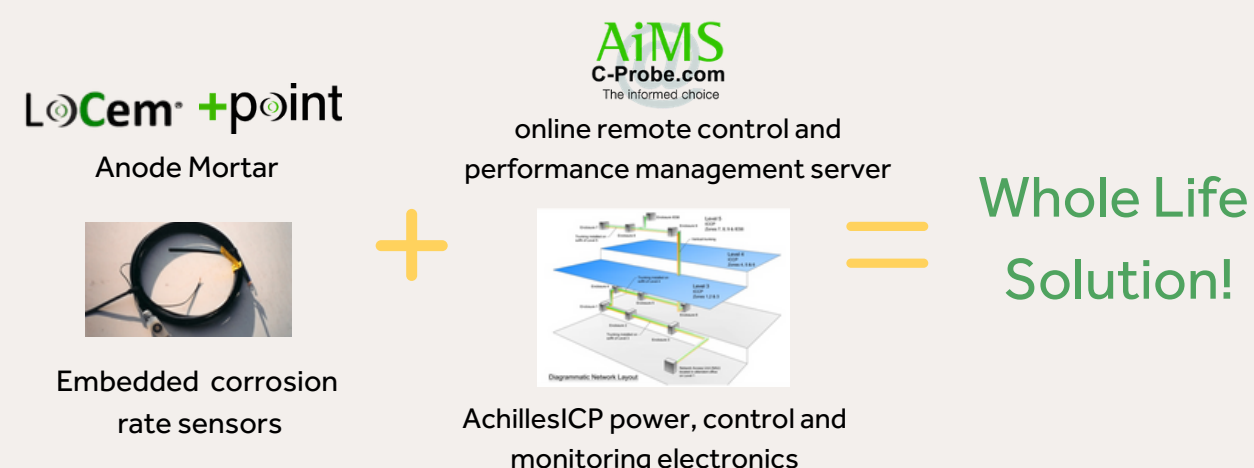
Before



After

Elements of the Installed System

The key components of retrofit system installed throughout Terry's Chocolate Factory includes:

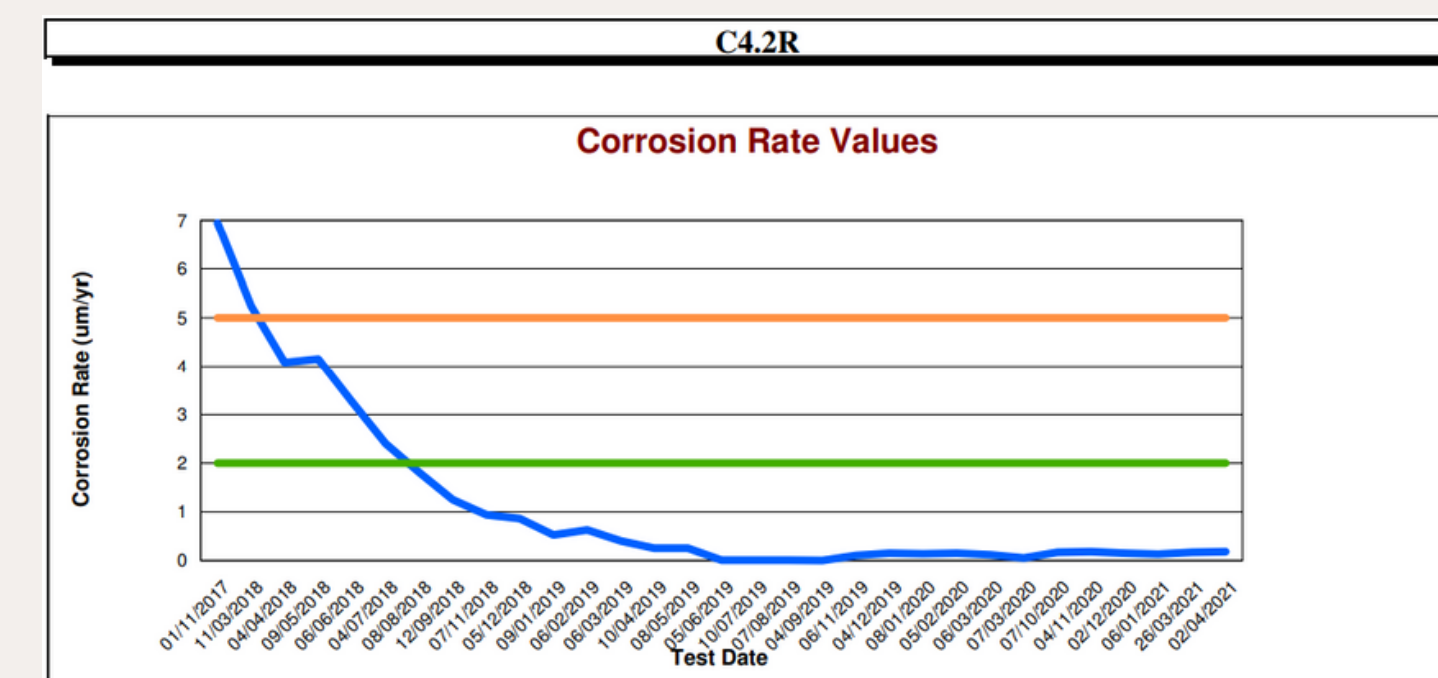


As moisture and water leak into the fabric of buildings, this destroys protective coatings. Over time, corrosion will propagate and, where the masonry is in intimate contact with the steel or infill mason's mortar, cause the rust packed layers to result in the tensile forces cracking and moving the brick skin. The problem will perpetuate until the failure of the façade as cracks allow more moisture and oxygen to react to form more corrosion forces.

To tackle this problem effectively, impressed current cathodic protection (ICCP) was used as a method to control corrosion whilst the cracking and movement were repaired. ICCP is a technique used to control the corrosion of a metal surface (steel) by making it a cathode of an electrochemical cell, which is done by passing a current through via anodes that are inert in themselves but allow protection current to flow.



Post Restoration Performance



The graph shows the reduction of corrosion rate (blue) experienced over 4 years following energisation of the +point® anode ICCP system in 2017. The corrosion rate values are compared to threshold values of 2um/ yr (green) and 5um/ yr loss of steel (orange) as proof of control of corrosion condition of the steelframe. These values also relate directly to service life extension for the property where the lower the corrosion rate the longer the service life of the structure, tracked with real data.

Our low carbon innovation, LoCem® +point® is manufactured from industrial waste by-products and repurposed as an anode mortar which allows installation within the bed joints in order to pass current through the brick infill to protect the steel.

The project would have complied with the recent Government policy of Environmental Social Governance (ESG), which all public procurement projects need to take into consideration from January 2021.

Using LoCem® helped cut emissions in the project by a factor of 6.4 or 80%



LoCem® is produced from recycled and waste by-products with no heat (energy) meaning it had a low carbon profile



Installation of an ICCP system eliminated the need for reconstruction or demolition. Both involve carbon-heavy processes.



Each year the UK produces 200k tonnes of waste and 2/3 of this comes from construction waste. The reuse of this building significantly reduced the construction waste and retained the existing embodied carbon

Long-Term Benefits

- Building's service life is extended for another 100 years.
- Cost-effective, non-disruptive installation of ICCP system that preserved aesthetic of the building.
- Asset owners have full transparency of corrosion data with AiMS, meaning they can make informed maintenance decisions, reducing cost and social disruption.
- Sustainable and ESG compliant – embodied carbon of the building would have been retained and the materials used (LoCem) would have reduced CO2e of the mortar by 80%.
- Technically and financially preserving value of the asset.

"I have worked with C-Probe over many years and have continued to be impressed with their entrepreneurial spirit and awareness of the importance of finding affordable and sustainable solutions to problems in the built environment. ICCP offers a durable route to extending the life of structures almost indefinitely and frees the owner from an endless cycle of repairs to make good corrosion-induced damage. Geopolymer-based anode systems, developed by C-Probe with SHU, and with input from Mott MacDonald, has proved to be particularly suited to the life extension of sensitive structures such as heritage buildings, and is itself manufactured in a sustainable manner from industrial by-products. A uniquely sustainable technical solution, employing sustainable materials."

Prof. Paul Lambert,
Head of Materials and Corrosion Technology, Mott MacDonald.

C-Probe Systems
Limited Unit 2, Sherdley Road
Industrial Estate, Wharton St
St Helens WA9 5AA
United Kingdom

01744 611555

c-probe.com

cwalker@c-probe.com