Rowan Technologies Ltd
Cathodic Protection Case Studies

Rowan Technologies Ltd are experts in the application of cathodic protection to historic buildings and monuments, and have installations in many prominent and listed structures. The following case studies are just some of the cathodic protection systems we have installed in recent years. Studies include both impressed current cathodic protection (ICCP) and sacrificial anode cathodic protection (SACP) installations. For more information, please visit www.rowantechnologies.co.uk or call 0161 748 3644.

Wellington Arch, London
Impressed Current CP (ICCP) - Steel Framed Monument

Rowan Technologies installed an ICCP system on the Grade 1 listed Wellington Arch in London in 2000. Due to previous water ingress, the key steel 'I' beams had suffered from significant corrosion. These steel filler joists had been physically displaced by up to 20mm in places, resulting in the cracking of historic stonework and the jacking up of the quadriga.

Titanium ribbon and discrete anodes were used throughout the installation to facilitate a uniform current distribution. The ribbon anode provides maximum surface area ensuring efficient transfer of the corrosion inhibiting electrical current which is vital to sustain long term cathodic protection performance.
In the 19th Century, steel inserts were added to the northern transept of Gloucester Cathedral. In recent years, these embedded steels have been subject to corrosion and expansion, resulting in the cracking of the surrounding historic stone.

In 2006, Rowan Technologies designed, installed and commissioned a discrete ICCP system to provide long-term corrosion control to the embedded steels.
The asphalt roofs of this Benedictine monastery have been subject to water ingress and the embedded steel joists have suffered from corrosion and expansion. The expansion has resulted in cracks as wide as 35mm developing. An ICCP system was designed, installed and commissioned by Rowan Technologies in 2006 to control the corrosion of the embedded steel joists.
Manchester Town Hall Extension
ICCP - Steel Framed Building

Grade II listed Manchester Town Hall Extension was completed in 1938 and forms part of the city's Albert Square Conservation Area. The steel frame of the building has been subject to corrosion at low level, resulting in the development of cracks around the base of the piers.

Two ICCP systems were installed by Rowan Technologies in 2007 to suppress the corrosion reaction and protect the historic sandstone façade from further cracks developing.
Rowan Technologies was asked to design, install and commission an impressed current cathodic protection system to St Catherine’s Church in Batheaston, Somerset.

14th Century ferrementa ironwork covering the historic south window had been corroding for a number of years and was causing cracking of the surrounding stonework. The CP system was installed during November and December 2008 to help control the corrosion.
Sherborne Abbey, Dorset
ICCP - Wrought Iron Rib Reinforcements

Sherborne Abbey boasts the earliest fan vault to be built in England (c. 1425). The fan vault had been subject to subsidence over the centuries, and a wrought iron reinforcement system, covering the bottom and top faces of the ribs, was installed in about 1840. Moisture ingress from the North and South walls had allowed the iron reinforcements to corrode, ultimately leading to spalling of some of the stones and resulting in the tower being cordoned off. Rowan Technologies designed, installed and commissioned an ICCP system in 2001 to control further corrosion.
This grade II listed Orangery in Northamptonshire has approximately 500 wrought iron cramps, dowels and restraints that have been subject to corrosion. The expanding corrosion product has forced the historic ashlar to crack and spall eventually resulting in a loss of fabric in numerous locations. An ICCP system was designed, installed and commissioned during 2006/07 to control the ongoing corrosion.
Rowan Technologies are specialists in providing cathodic protection to historic concrete. The three early warning sound mirrors on the Kent coast were built using reinforced concrete in the late 1920s and the early 1930s to detect the distant sounds of enemy aircraft approaching from over the English Channel. The reinforced concrete has deteriorated in the marine environment and many parts of the structure are suffering from corrosion of the reinforcements and delamination of the concrete cover.

In the latter part of the 20th century, the Listening Mirrors were 'scheduled' by English Heritage as being of 'outstanding national importance'. A recently-developed remote sacrificial anode cathodic protection system was used to control the ongoing corrosion of the concrete reinforcements without the need for mains power.
In 2005 an ICCP system was designed, installed and commissioned to provide long-term corrosion control to the steel cores of four piers in the crypt of Gloucester Cathedral. These steel cores, which had been inserted post war, were subject to corrosion and expansion leading to cracking of the 11th century historic stones at the top and bottom of the piers.
The Rose Window in the 19th century Benedictine Abbey has a wrought iron support ring running through the Victorian glazing. This wrought iron ring has been subject to corrosion in recent years, leading to cracks developing in the historic stone. Rowan Technologies designed, installed and commissioned an ICCP system to provide long-term corrosion control to the iron support ring of the Rose Window.
The wrought iron cramps in the Grade II listed Whitchurch Almshouses have been subject to corrosion ultimately leading to the spalling of the Ashlar façade.

In 1999, a pioneering SACP system was installed to help protect the cramps from further corrosion. Magnesium anodes were buried in the ground and electrically connected to the embedded iron cramps using 'key hole' surgery in order to minimise the damage to the surrounding stone.
This Grade II listed building has a pediment dating from 1913. It was constructed of clinker concrete with a render finish and had 'I' beams within the central construction to provide support. The front of the pediment contained various pieces of statuary, which had been cast into the outer stones, and this important façade would have been seriously damaged if the steel had to be replaced. An ICCP system was therefore installed to control further corrosion and conserve the historic stonework.
Inigo Jones Gateway, London
SACP – Cramps

The Grade 1 listed Inigo Jones Gateway (1621) is located in the parklands of Chiswick House. The embedded wrought iron cramps were corroding leading to expansion and damage of the surrounding historic stonework. Rowan Technologies' Remote Sacrificial Anode (RSA) technology - located discretely in the ground, overcame the requirement for mains powered electronics to power the cathodic protection system.
The west window of Lincoln Castle Prison has been suffering from corrosion of the cast iron window frames for a number of years. The expanding corrosion product has resulted in the cracking of surrounding historic stonework. It was thought that to remove, repair and refit the window frames would be too destructive. Rowan Technologies designed, installed and commissioned an ICCP system during 2009/10 to control the corrosion of the ironwork.
In 2011 Rowan Technologies was awarded a contract to replace the electronics for an extensive, distributed ICCP system that was installed during a total refurbishment of St. Andrews House, Edinburgh some fifteen years ago. St. Andrews House forms the working offices of the Scottish government.

The ICCP system was installed to inhibit the corrosion of the building’s steel frame. The CP electronics enclosures are distributed throughout the building and communicate with a central control and data acquisition cabinet. The work involved complete replacement of the electronics and control systems and subsequent system recommissioning. Rowan Technologies can continuously monitor the performance of this system via a remote communications link to our offices.
ICCP systems have been installed to the two towers at Clifton Suspension Bridge, Bristol to assist with the long-term corrosion control of the embedded iron components (individual cramps, holding down bolts and cast iron roof sections). The iron components have been subject to corrosion which has cracked and spalled the pier stones.

The ICCP system on the Clifton tower was commissioned in October 2015 followed by the Leigh Woods tower in August 2016.
An ICCP system has been installed to the spire at St Michael’s church, Bath to assist with the long-term corrosion control of the embedded iron components (tie bars, ring beams and individual cramps). The iron has been subject to corrosion which has been spalling the stones and jacking up the masonry of the spire.
Two ICCP systems were provided to assist with the long-term corrosion control of the embedded iron armatures and restraints to six muses at Seaton Delaval Hall. The embedded wrought iron components have been subject to corrosion, leading to expansion. This has resulted in cracking and delamination of the plaster and lime mortar used for the muses. The damage has been repaired at various times in the past but corrosion has continued. The ICCP systems were therefore installed to reduce the ongoing corrosion of the iron components.
During a recent major refurbishment of the building, a large ‘I’ beam was discovered approximately 10m in length and 600mm high. The beam is embedded behind a Portland stone façade and lies behind large statuary (by around 1m) on either side. Ongoing corrosion of the steel beam had resulted in lifting of the external stones by around 5 to 10mm and had also pushed out of the back of the statues.

Removal of the statues to access the beam was considered to be too disruptive and other methods, such as the use of cathodic protection were considered. Ultimately one of Rowan Technologies’ ICCP systems was installed to assist with long-term corrosion control.