



Weather Station – Canterbury Cathedral

Case Study

Historic Building Condition Monitoring for Conservation

December 2017

BACKGROUND

Canterbury Cathedral is the Mother Church of the worldwide Anglican Communion, and it has been a UNESCO World Heritage Site since 1988. This is a complex and prestigious site which has been in use since the 7th century. A wide range of specialised heritage and conservation professionals now assist in managing the site. Understanding the micro-climates within and around the building as well as understanding changes in the building itself are crucial to the maintenance of the fabric and care of visitors and worshippers in this very active Cathedral. The Eltek monitoring system at Canterbury was initially installed in 2007 and has evolved over the last 10 years, demonstrating the flexibility, ruggedness and reliability of the Eltek product range.

Flexible system

The versatile and modular range of sensors in the Eltek system allows for a wide range of sensors to be added as and when required. This example of monitoring the conditions at Canterbury Cathedral illustrates the phased expansion capacity of the system as the data is interrogated in increasing depth. There are many areas of the cathedral site being monitored. This case study gives a brief description of each area.

Specialist expertise

Eltek Ltd. works in close co-operation with Tobit Curteis Associates who specify the

appropriate monitoring equipment requirements. Tobit Curteis Associates is a practice specialising in the investigation, monitoring and control of environmental deterioration in historic buildings and collections and the conservation of wall paintings and polychrome surfaces.

The Black Prince's Tester

The Black Prince's Tester is an image of the Holy Trinity painted onto a wooden structure. An Eltek datalogging system was installed to help understand the deterioration mechanisms of this important and complex painted work. Located on the South side of the Cathedral and close to

windows, it was exposed to high light levels at various times of the year. Additionally, the impact of the Victorian heating system was causing a temperature gradient across the work. The Eltek system gives an understanding of the conditions and the efficacy of preventive measures. The following sensors were deployed to provide the required information:

- *Visible and UV light sensors*
- *Crack meter*
- *Surface, ambient and radiant temperature*
- *Humidity*
- *Local weather*

Libraries and Archives

The Cathedral holds a large collection of historic archives and library materials. Using Eltek repeaters to extend the radio range of the transmitters meant that the data logging system could be easily expanded to cover a larger area than just the main body of the Cathedral. Outlying buildings and heavily built strong rooms were thus also provided with radio coverage

Wall Paintings

Temperature, relative humidity and surface temperature are recorded at several sites in the body of the Cathedral, the crypt and the roof spaces. A weather station records external conditions including temperatures, wind speed & direction and rainfall. Interpretation of this data provides information on the thermal and hygral buffering of the building envelope, an indication of the risk of salt activity and the effect of visitor flow. The Darca Heritage software is used to calculate parameters such as absolute humidity (AH) and dewpoint temperature (DPT) from these physical parameters and to plot and interrogate the data.

Stained Glass

After initial installation, the Eltek system was soon expanded to include more transmitters. The stained glass conservators wanted to be able to understand the conditions around important mediaeval glass and to be able to measure the effectiveness of interventive treatments. Sensors were developed to measure surface wetness and airflow in addition to the surface and ambient temperatures and RH already in use.

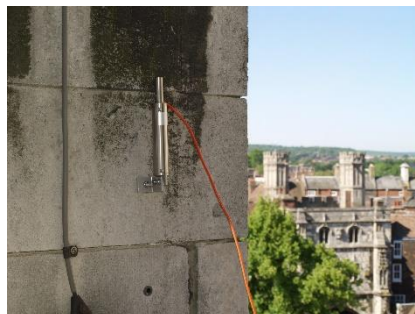
Structural Monitoring

To help plan preventive and maintenance work and assist an expert team of stonemasons, the Eltek monitoring system was extended to provide structural



Crack sensing

information at points in and around the Cathedral. Structural monitoring now in place includes monitoring the movement in cracks or joints, using inclinometers to accurately measure the effect of wind loading and bells ringing in the main Bell Harry tower and piezo sensors in bore holes to measure the movement of the water table around the building.



Soil Instruments C12 Inclinometer

Analysing the data from a single software application The data logging system has been running since 2007 and now extends to approximately 70 transmitters and 200 channels of data.

Site-based data acquisition, analysis and reporting software



The Darca Heritage software allows for this complex collection of data to be downloaded and

scrutinised in one software application. The site is divided into Zones relevant to each user group so that the most relevant information is immediately available to the user.

System components

The system installed at the Canterbury uses a variety of Eltek products, including the following items:



RX250AL Logger

GL70 Lux transmitter



TMET weather station

GD10 temperature and Relative Humidity



GS44 Tilt & crack transmitter

Eltek Ltd would like to express its thanks to Tobit Curteis Associates <http://www.tcassociates.co.uk/>

for their help in the preparation of this case study.

For further information about Eltek dataloggers, please email: Sales@eltekdataloggers.co.uk

or call +44 (0) 1223 872111