

## **Aspects of conserving exposed concrete architecture**

### **With the Wotruba Church as an example**

**Matea Ban<sup>\*</sup>, Wolfgang Schwarz<sup>\*\*</sup>**

**\* University of Applied Arts, Institute of Conservation, Vienna (A)**

**\*\* Composite Anode Systems GmbH, Vienna (A)**

#### **ABSTRACT**

This study illustrates the conflict surrounding the conservation of modern and contemporary concrete architecture by drawing on the example of Vienna's 'Church of the Holy Trinity' (1974-1976), popularly known as the 'Wotruba Church'. A sacral sculpture built entirely from reinforced concrete, Wotruba Church's hilltop location has left it exposed to intense weathering for nearly 40 years. Following vigorous debate over the environment's impact on the structure's durability, the city's archdiocese took up a suggestion by the Institute of Conservation and Restoration of Vienna's University of Applied Arts to conduct a thorough stability and damage analysis using non- and low-destructive examination methods. The concrete's strength, cover, position, depth and diameter of rebars, air permeability and capillary suction, were determined at representative locations of the structure's interior and exterior using non-destructive testing (NDT) techniques. Carbonation depth and concrete microstructure was examined on cores drilled from concrete exposed to and protected from weathering. Furthermore, the ambient temperature and relative humidity both outside and inside the structure were monitored and recorded over a period of one year.

The main findings were:

- Weather-induced alteration of the concrete's surface (colour changes, microbiology, surface cracks, erosion of edges and corners, local delamination of the concrete cover) is not an indication of structural damage, but merely evidence of concrete's natural aging and the development of patina.
- detected Two different concrete qualities - different aggregates, one with a high clay content – were detected by strength, air permeability and capillary suction measurements. As expected, weathering was more pronounced on concrete surfaces with higher permeability, but the effects had no structural significance and did not require restoration or conservation measures.
- Weathering on the north side of the structure was more pronounced, with the examination results suggesting control intervals of about 10 years.
- The chosen combination of NDT examination methods proved to be a cost and time efficient approach for assessing aging concrete structures.

Moreover, some of the necessary treatment, such as crack closure and the tightening of leaking joints, required materials already commonly used in the preservation of historical-architectural heritage to be tested in laboratory and field trials prior to application. These instances have been outlined with examples. The findings in this study have provided the basis for a well-founded discussion concerning further measures and a sustainable and durable treatment strategy..