STUDIES ON THE FABRIC DETERIORATION OF THE CHURCH OF SANTA CATERINA D’ITALIA IN VALLETTA

Jean Frendo

Dissertation submitted to the Institute for Masonry Construction and Research in partial fulfillment of the requirements for the Degree of Master of Science in Conservation Technology for Masonry Buildings

ABSTRACT

The Church of Santa Caterina d’Italia in Valletta has a badly deteriorated fabric, externally and also internally in part. The deterioration is due to the interaction of the environment with the fabric and absence of repair over the years. This research work consists of studies on the decay phenomena of the fabric of the church. The building is of local masonry construction in porous Globigerina limestone, a freestone of nearly pure calcite. This organic softstone is easily worked and bonded with lime-sand mortar which is of lower compressive strength than the masonry block.

Historical research provides an insight into the reasons why certain areas are more deteriorated than others. This is due to lack of or improper maintenance, shelter from adjacent buildings, which no longer exist, as well as various construction and restoration interventions. History also provides information about when the church was built, construction methods, architectural form, later transformations and restoration work. The background for any future interventions is also established.

Detailed mapping of external and internal weathering forms, on a stone by stone basis, is presented. Sample areas were chosen for this purpose; the portico on the exterior and part elevation on the east and west sides inside the church, corresponding to areas which had most and least damage respectively. The sample areas were selected to demonstrate the range of defects, typical of the external facades and of the lower area of the internal walls. The extent of the damage was gauged on site, as far as possible, from the ground, by physically measuring the depths of the decay phenomena by means of a ruler. A pair of binoculars with a good magnification 10x50 as well as detail photographs, a large-scale photogrammetric survey and rectified photographs were all availed of to carry out the mapping of weathering forms on the church. The stonework was inspected in detail on a stone by stone basis. Detail drawings mapping this survey were produced and analysed. Correlation of weathering forms to severity of decay indicated severe damages occurring over 54.0% of the portico area on the exterior. On the interior 18.5% of the east side sample area was severely damaged compared to 2.5% of the west side.

The internal hygro-thermal environment was monitored for two years and the external climatic parameters were measured for one year in order to obtain a knowledge of the fabric decay phenomena. The recorded data was plotted against time for further analysis. The plots included the distribution of mean monthly extremes and total monthly values over a year as well as the distribution of daily extremes and total daily values over each
month. Moreover, distribution of the hourly values over some months and a selection of three-day periods were also presented to show the diurnal variation. This provided information on the influence of the external microclimate on the internal environment. The internal daily air temperature extremes did not vary much during each month, less than the external. With the exception of a few days, during June, July and August the internal daily minimum air temperature was a few degrees higher than the external. During this period, the internal daily minimum relative humidity remained relatively high between 48% and 78% compared with the external, which ranged between 17% and 75%. The internal daily maximum relative humidity followed relatively well the external throughout the year.

This research work provides the basis for further studies on deterioration processes and hence on restoration interventions on the church. The correlation of the hygro-thermal data analysis with the condition of the masonry of the church is a field of study worthy of further investigation.