



MECHANICAL DEGRADATION OF A HISTORIC WOODEN CABINET: MODELLING OF HEAT AND MOISTURE INDUCED STRAIN BASED ON A RECONSTRUCTION OF THE HISTORICAL INDOOR CLIMATE

Zara Huijbregts^a, Henk Schellen^b, and Jos van Schijndel^c

^a *Department of the Built Environment, Eindhoven University of Technology, The Netherlands, z.huijbregts@tue.nl;* ^b *Department of the Built Environment, Eindhoven University of Technology, The Netherlands, h.l.schellen@tue.nl;* ^c *Department of the Built Environment, Eindhoven University of Technology, The Netherlands, a.w.m.v.schijndel@tue.nl*

ABSTRACT:

Amerongen Castle, an important heritage site in the Netherlands, has a unique collection: many objects of art were purchased by the family who owned the castle during the 17th and 18th century. Among the collection items are two wooden cabinets that are attributed to the Dutch cabinet maker Jan van Mekeren and were made around 1700. From historical data it is assumed that at least one of these cabinets has been in the castle since the beginning of the 18th century. Nowadays both cabinets show considerable mechanical degradation. In particular, large cracks are visible in the doors and side panels. The objective of this study is to investigate if this damage can be attributed to the historical indoor climate in the castle. The research method consists of several parts: (1) on-site measurements of the present indoor climate in the castle and the microclimate conditions around the cabinet, (2) experimental analysis of the hygroscopic and mechanical properties of the cabinet doors by climate chamber experiments with mock-ups, (3) reconstruction of the historical indoor climate in the castle based on hygrothermal building simulation models, historical outdoor climate data and thermohygrograph charts from the recent past, (4) numerical assessment of the heat and moisture induced strain in the cabinets doors as a result of indoor climate variations. The results show that damage may not be caused by the regular historical indoor climate in the castle, but that infrequent events such as flooding or temporarily restoring of the cabinets may have contributed to the damage, as well as ageing of wood and glue.