

## **Evaluation of the collapse limit of Japanese masonry walls, under long-term load**

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### **SUMMARY**

Restoration works of masonry walls of time-honored castles in Japan necessitates the clarified knowledge of basic mechanics of the structure in addition to traditional building techniques in the foundation days. Masonry walls of Japanese castles designated as cultural heritage are mechanically distinctive in two respects: they are built without cement which fastens wall stones together and with concave slope curve called "Sori". Recently the building techniques were recorded in archives and have been elaborated. The paper presented here deals with collapse limit of "Tsukiishibu" section in the masonry wall. "Tsukiishibu" section represents the whole part of the masonry walls excluding corner. The collapse limit of the section in the masonry walls under long-term load stress was investigated in three aspects: First, formulae to get a critical height of the masonry walls were introduced under conditions of critical failure mechanisms. The critical heights concerning such variables as slope angles of the walls and internal friction angles of stone blocks and back fill soil were calculated and design curves were drawn. Second, a safety factor of the masonry walls at critical failure mechanisms was proposed. Employing the safety factor, quantitative analysis of the stability of extant masonry walls was made possible. And thus, masonry walls are now able to be restored based on the structural mechanics presented by us. Last, mechanical implications of the concave shaped slope of masonry walls called "Sori" were elucidated. "Sori" was found to afford constant safety factors all along the slope of walls, leading to construction of masonry walls with increased height.