別紙４

報告番号	※　　第　　号

主　論　文　の　要　旨

論文題目 Rubble Stone Masonry Buildings with Cement Mortar: A Comparative Review of Seismic Design Specifications, Cost Implications and Base Shear Seismic Demand on a Worldwide Scale
（セメントモルタルを用いた不整形石積組積造建物：耐震設計規準・耐震化コスト・要求耐震性能の国際的比較検討）

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論　文　内　容　の　要　旨

This thesis questions the current state-of-the-art and knowledge levels regarding the seismic behavior and resilience of “non-engineered” vernacular construction techniques, and in particular rubble stone masonry buildings. Such techniques rarely behave well in earthquakes, and the most devastating levels of damage and loss occur in developing countries.

In-depth reviews of the seismic features of “non-engineered” and vernacular techniques show that the national codes, technical regulations and practical manuals are outdated, contain many contradictions, and have become ambiguous. This raises questions about the completeness and correctness, as well as about the reliability and actual value of the knowledge in this field. Fact is that an estimated number of 217 million people will continue to live in stone houses in the Himalayan region alone, who are in need of reliable and up-to-date technical information.

A first important step is acknowledgement of the current situation. The acknowledgment must be accompanied by the prioritization of scientific research, focused on advancing our understanding and improving the resilience of low-tech

vernacular buildings in seismic events. The time has come for "Non-Engineered 2.0". To address any shortcomings, a research initiative is started by the name of SMARTnet, which stands for **S**eismic **M**ethodologies for **A**pplied **R**esearch and **T**esting of **n**on-**e**ngineered **t**echniques.

The core of this thesis is divided in three main parts. The first part is a global review of the state-of-the-art with regards to the knowledge levels of rubble stone masonry buildings in seismic areas, to determine where we stand today and how the knowledge is perceived. The second part analyzes detailed and localized cost comparisons of the earthquake-resistant elements in masonry structures. The third part works toward the development of practical applications and structural solutions. It includes base shear seismic demand calculations which are performed on two case study buildings, according to the seismic codes of nine selected countries. The thesis concludes with an appeal for clear terminology and the international adoption of "Nominally Reinforced Masonry" (NRM) for walls that are nominally strengthened, for which Stand-Alone codes and manuals must be developed and published.

The thesis ends with an international call for collaboration with the SMARTnet projects and an invitation to experts, professionals, academics and final-year students to support the project with their time and expertise.