

VULNERABILITIES OF RESIDENTIAL BUILDINGS IN ENGLAND TO THE PHYSICAL FORCES IMPOSED BY FLOODS

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Floods cause extensive damage to residential properties in the U.K. as illustrated by the 10,000 homes flooded during Autumn 2000. Flood damage prediction in the U.K., though, rarely uses more than depth-damage curves. This study analyses the physical forces imposed on residential properties by floods. A force typology and the relative importance of each force are presented. Residential buildings are analysed by component to determine the relative importance of different failure modes under applied forces. This analysis illustrates that the three most relevant failure modes for modern English dwellings are window and door glass breaking, cavity brickwork walls collapsing, and the infiltration rate of floodwater from outside the property to inside. These three modes are quantified by applying techniques from, respectively, materials science, structural engineering, and fluid mechanics plus building ventilation. Combining these results with detailed field surveys of more than 1,000 residential buildings over two case study sites in eastern England, a methodology for profiling the flood vulnerability of individual residences and entire communities is developed. Implications and recommendations for reducing building and community vulnerability are interpreted in the context of other natural hazards threatening the same areas.