EXPERIMENTS ON BRICK WALLS

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It is often concluded that the yield line theory with some modifications gives good results for the ultimate static and dynamic failure load of brick walls. This theory is relatively easy to apply. However, the required ductility is not obtained by ductile material behaviour, but is apparent because of the support conditions in the experiments. It is therefore questionable whether this theory could be applied in the case of simply supported walls of, for instance, the non-bearing facades of Dutch family houses. Therefore an experimental research program was carried out at the request of the Coordinator Civil Emergency Planning of the Ministry for Housing, Physical and Environment. Brick walls were loaded statistically with the help of an airbag and dynamically by means of a blast simulator. Auxiliary tests were performed to determine the material properties.

The paper discusses the test results in relation to calculation methods. During successive shock loading an elongation of the natural period was perceived without visual cracking of the walls. The ultimate dynamic load was predicted quite well by the modified yield line theory and also the crack patterns showed resemblance with the expected yield lines. However, the absence of a ductile behaviour after the appearance of the cracks led to the conclusion that the elastic plate theory has to be applied in this case. From the comparison of static and dynamic tests an increase of 40 percent in the tensile strength could be derived for the dynamically loaded walls.

The paper also discusses the blast wave characteristics of the air-driven blast simulator and the response of the test specimen in relation to a brick wall in practice, loaded by a shock wave.