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DROP TESTS AND DYNAMIC FINITE ELEMENT ANALYSES OF STEEL SHEET CONTAINERS FOR FINAL DISPOSAL OF RADIOACTIVE WASTE

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Abstract. Within a safety assessment, containers for radioactive waste have to withstand drop tests at defined conditions. Alternatively to prototype drop tests, numerical methods can be applied, if they are suitable and sufficiently verified. This paper describes the development of a finite element (FE) model of a thin-walled steel sheet container used to investigate dynamic load scenarios due to impact events. Experimental and numerical analyses were performed for different drop orientations. The results are compared to prove the suitability of the FE model.

1 INTRODUCTION

The use of steel sheet containers is planned for final disposal of non-heat generating radioactive waste in the German Konrad repository. Until now the mechanical safety of the container designs has been proved by drop tests with prototype containers according to the Waste Acceptance Requirements [1]. Alternatively, the safety assessment by calculation is allowed, if the calculations are suitable and sufficiently verified [2] e.g. by comparison with experimental results. For example, in [3] the mechanical behaviour of cast iron containers was analysed by FE calculations. However, reliable numerical simulations of drop tests with thin-walled steel sheet containers for safety assessment purposes currently do not exist. Therefore, a research project was started at BAM Federal Institute for Materials Research and Testing in order to develop a realistic finite element model and an explicit calculation procedure for steel sheet containers under dynamic loads. This paper presents the development of a FE model for the steel sheet container Konrad Type V. In a first step numerical and experimental investigations of flat bottom-side drop tests as well as the drop with the long bottom edge onto an essentially unyielding target with an unloaded steel sheet container are discussed.