COMMENTS ON THE EFFECT OF THE THREE EXTERNAL LOAD CASES – EARTHQUAKE, AIRPLANE CRASH, OUTER EXPLOSION – ON THE DESIGN OF BUILDINGS AND EQUIPMENT OF NUCLEAR FACILITIES – A COMPARISON

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SUMMARY

The main loads for design of buildings and equipment of nuclear facilities are those due to (a) working loads, (b) loads from fault conditions and (c) external load cases.

The present paper deals with the latter problem and gives a survey of the loads resulting from the three external load cases as well as a survey of the methods of calculation.

Attention is first drawn to the global moments and forces of the buildings, which are necessary to investigate the stability of the structure as a whole (the local problem of penetration of an air-plane will not be considered as it is studied in detail by other authors).

Second, attention is drawn to the response of the building, especially to the floor response spectra, which are necessary to evaluate the response of the equipment due to the induced vibrations of the buildings.

Three different nuclear power plant buildings are studied and global forces and moments as well as selected floor response spectra are given. The mathematical models employed and the method of calculation are compared with state-of-the-art-methods as well as methods under development. An assessment is given whether the methods are reasonable.

The results obtained for buildings of different shape and dimensions are discussed with respect to magnitude as well as importance for design. Criteria are given, assisting in answering the question which of the three load cases may be expected to become governing load case.