Protective Structures – A Challenge to Computational Engineering and Testing

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ABSTRACT

Protective Structures are developed and erected in order to protect the society against threats. Their origin might natural, manmade or accidental. In this paper we will concentrate on the latter considering explosion and impact effects on structures. First the actions (explosion and impact) and their governing parameters are described. Next the modelling of the building material will be given. The material behavior is mainly dependent on strain rate as well as high hydrostatic pressure. The strain rate magnitudes might be up to 10^8 s^{-1}, corresponding to a load duration of approximately 10μs. Having discussed the numerical modelling of the material, protective structures will be addressed. In order to study protective materials as well as protective structures we use mainly the explicit finite element method as well as experimental methods. In both cases we have to deal with models that need to be verified and validated. Special focus will be laid on structural glazing.

Contemporary architecture highlights building envelopes made of glass. Facade technology has become a new field of technology in the last years. However these facades are vulnerable when hurricanes, tornados or blast have to be taken into account. Therefore, protective glazing is an important field of research and development. Surprisingly, there are papers that are inconsistent in the research results. This is amongst others due to the fact that no guidelines for testing exist. Another problem is the interpretation of test results. The present paper will discuss the state of the art in design as well as research and development. Own projects and studies will be presented.

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