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Load models and structural design issues for flexible debris flow barriers

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In the past years, flexible net systems provide an alternative protective solution against debris flows to common rather massive retention structures. Different issues already have been solved on how to deal with the aspects that have tob e considered for an effective flexible debris flow barrier. However, typical for a rather young structural solution is the absence of international standards regarding such barrier types. This contribution therefore lists some relevant issues with the current state of the art or proposals on how to solve possibly critical points.

The structural details are often defined by the different manufacturers. However, the boundary conditions regarding positioning in the field, bottom openings, retention volume etc. usually are prescribed.

The currently most discussed topic is the design of flexible debris flow barriers. First of all, a proper load model that also considers the dynamic interaction with a barrier. Different approaches exist such as experimental design tests, physical modelling, analytical models or numerical simulations. The latter again has to map at best both the barrier and the moving debris. It the debris is part of a model the magnitude of the pressure acting on the barrier can be set following different approaches. A possible load model for example discretizes the continuous filling process over time and stepwise fills the barriers. For each step the pressure distribution is calculated. In case that the barrier gets overflown another load case serves to prove the stability of the barrier.

Despite the load model chosen, it must be accepted by the rules of the country where the barrier should be installed in. Hong Kong was the first state giving out some regulations regarding the design of flexible systems against debris. Other nations follow slowly. However, at best an international standard can be found that previously has to be fully discussed within the scientific community and – of course – with the manufacturers of such protection systems.