The design of dams with full or partial overtoppable crests already has a long history. Since recently their number is increasing constantly, but there are still open questions concerning their design. Design formulas in the literature give different results. One of the reasons could be the underlying model test assumptions. Model test on two different sets were performed and their results compared to recommendations from literature.

**Scientific questions**
- flow characteristic on the overflow section
- forces on the lining or single stone
- location of overtopping section
- best and economic type of slope protection
- design rules and recommendations

**Goals**
- clarification of failure mechanism
- establishment of underlying physical behavior in models and in nature
- verification of rejection of existing design formulas
- design recommendations

**Approach**
- literature study
- investigation of existing structures
- model tests

**1. Lining (bank protection)**
- Riprap / placed riprap
- Paver stones, e.g. grass paver stones
- Open-stone asphalt

**2. Consolidation with soil cement**

**3. Composite methods with geotextiles or gabions**

**State of the Art**

**Riprap 1V:2H – Series 1 with “box model”**

**Riprap 1V:2H – Series 2 with “half-dam”**

Testing the first set it was found that the failure mode was often a slip surface along the border of the lining and the filter. That means that the whole rip-rap slipped one to two centimeters. Thus opening a joint at the dam crest and destabilizing the single stones. By increasing the discharge the riprap was destroyed beginning from top down to bottom. Sometimes the slip would occur earlier but the rip rap would stay stable until a higher discharge. By protecting the upper fourth of the riprap we could improve the performance reasonably.

**Summary and Physical Model Test & Results**

**Summary**
- Several possible designs
- Existing design formulas give different results
- Model test reflect range
- Further tests needed to clarify influence of model setting
- Learning process for the large model test

**Outlook**
- Further tests with different slopes
- Future tests for different protection types
- Second series: design has to withstand a design discharge at least twice
- Third series: area model to check 3D effects (e.g. preferred flow paths)

**Large Model Test**
- 8m facing length
- 2m wide

**Problems:**
- consolidation joints at crest
- early failures at crest by preferred flow paths
- learning process!