

Physical model investigation of flood-protection bypass-tunnel in Lyss (Switzerland) (2010)

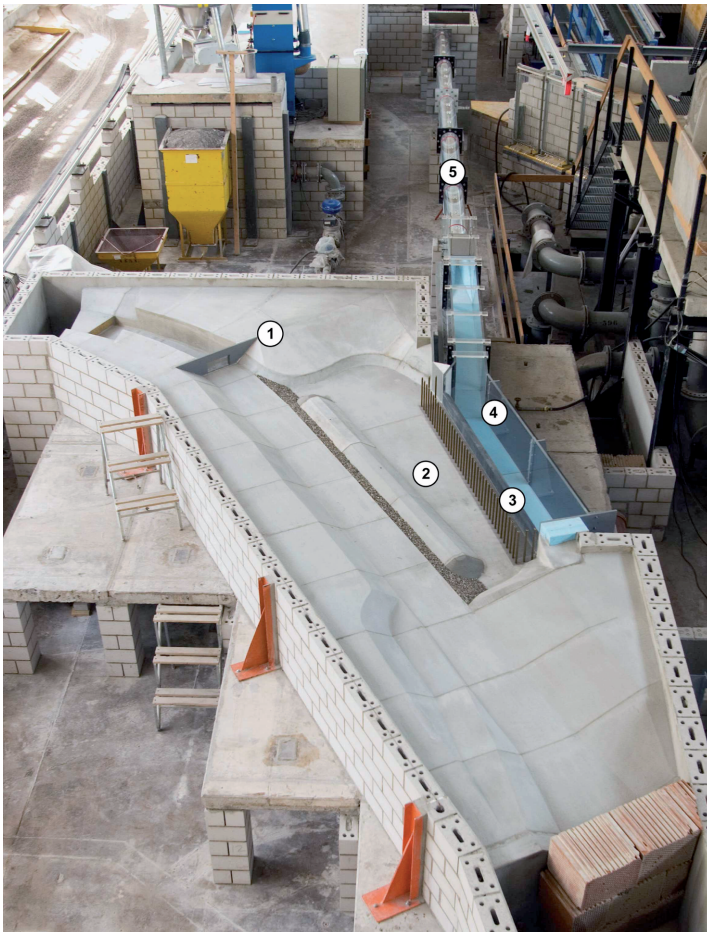


Fig.1 Overview of the 1:16 scale model at VAW

The river Lyss in the Canton Berne flooded the City of Lyss several times in recent years and caused damages of approximately 100 Mio. CHF so far. In summer 2007, three floods occurred. These events were mainly caused by insufficient discharge capacity of the river bed in the city because of reduced cross sections near buildings and bridges, besides large discharges. In order to protect the city from damages caused by floods, a straight bypass tunnel is planned. An intake structure upstream of the city will partially divert the water into the tunnel. As a consequence, the river Lyss itself only drains an appropriate discharge avoiding damages during a flood event.

The bypass-tunnel structure (Fig. 1) consists of (1) a throttle gate installed in the initial river bed, (2) a stilling pool, (3) an overflow weir, (4) a side channel and a transition zone, followed (5) by a 2.5 km long tunnel with a diameter of 4.0 m and (6) an outlet structure (not modeled). The entire structure is laid out for a 100-year flood equivalent to some 43 m³/s and can discharge a maximum of 64 m³/s.

The hydraulic efficiency of the structure has to be tested in a hydraulic model at VAW. One of the main goals is to ensure a sufficient discharge capacity correlated with a safe operation. Especially the cramped conditions at the intake prevent perpendicular approach flow conditions towards the weir, which is required for efficient

operation. The shape of the stilling pool was found as key element in this context. Furthermore, VAW investigates the effect of driftwood including racks, the flow conditions in the transition zone between the side channel and the tunnel, air flow conditions as well a junction of a small creek joining the main tunnel laterally.

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