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Comparison Of Dam Break Hydraulic Analyses Using Numerical Model

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Abstract :

Dams are an important part of this nation's infrastructure. When populations at risk are located close to a dam, it is important to accurately predict the breach outflow hydrograph and its timing relative to events in the failure process that could trigger the start of evacuation efforts. Surge waves resulting from dam breaks have been responsible for numerous losses of life. Sudden reservoir drawdown caused by partial breach of a dam can create a surge within the reservoir. Positive and negative surges are generally observed in open channels. Positive surges that occur due to tidal origins are referred to as tidal bores. A positive surge occurs when a sudden change in flow leads to an increase of the water depth, while a negative surge occurs due to a sudden decrease in water depth. A negative surge is an unsteady flow characterised by a decrease in water depth. Negative surges can occur downstream of a control structure when the discharge is reduced. They also occur upstream of a control structure that is opened rapidly or The failure time is very low. For a stationary observer the negative surge appears to be a gentle lowering of the free surface. The Hec-ras model based on the linearized implicit finite-difference model which based on the De St. Venant equations. When the surge occurs, the De St. Venant differential equations are not valid in the neighborhood of the surge. In general, a numerical analysis of unsteady flow in a reservoir has to be able to deal either with zones of supercritical and subcritical flow separated by a discontinuity or with flows that are entirely subcritical. In most cases the partial differential equations cannot be solved by analytical methods, but they may be solved to obtain approximate solutions by numerical methods. So a mathematical model with special surge equations is incorporated in the method of characteristics models. Thus, the models can describe closely the wave formations in the reservoir. They can establish the time and place of surge generation, and they can track the surge whether it is propagating under subcritical, supercritical, or mixed flow conditions. it is very important to understand wave propagation in a reservoir caused by a dam-break. when the failure time is very low, So a steep negative wave may be formed. In this case was used software Fortran 90 to solve approximate solutions .According to This paper provides the mathematical and analytical methods and numerical model using Hec-Ras to simulate dam break furthermore it used to predict breach outflow hydrographs .Unsteady flow modeling is often used in dam breach analysis due to the need to obtain more detailed or accurate results. Breach characteristics can be estimated in several ways which is describe the physical characteristics of a dam breach, use of those parameters within the unsteady flow routing model Hec-Ras , and the computation breach out flow hydrograph. The breach parameters will directly and substantially affect the estimate of the flows. Due to this illustrate the failure time is very low, So the negative surge occurs, However De St. Venant differential equations are not valid in the neighborhood of the surge. In order to evaluate the effective of negative wave on the outflow hydrograph. according to this, the outflow computed by the simplified model with approximate solutions based on Explicit Numerical method . The results of the Hec-Ras simulation, present that it was relatively closely to estimate peak breach discharges with approximate solutions.

Key Words: piping, dam break ,outflow , overtopping, Hec-Ras, Analytical models, peak breach discharge, numerical model, simulation.

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