Improving the pipe culvert efficiency by using inclined headwalls

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Abstract:

The inlet and exit geometry of the pipe or circular culverts has a significant importance in improving its performance, and increasing its efficiency. That is why the present experimental study focuses on testing the influence of equipping an inclined headwall in such culverts on the hydraulic efficiency, and comparing the results with the projected culvert (culvert without headwall). The present research consists of three trends of experiments, the first one for testing the effect of equipping an inclined headwall in the U.S. side of the circular culvert, while the second trend for testing the effect of equipping an inclined headwall in the D.S. side of the circular culvert, and the third trend was for testing the effect of equipping an inclined headwall in both sides of the circular culvert (U.S. and D.S.). In each trend, there are five models of headwall with variable inclination angle ranging from 15° to 90° were used in addition to the projected one as a reference for comparison purposes with a total of 240 runs. The study introduced a new effective tool for improving the circular culvert efficiency and insuring more safety for the traffic over such roads. The study showed that, the headwall of inclination angle 15° in the opposite direction of the flow gives the best results and the maximum discharge efficiency under the same upstream water depth in case of using U.S. headwall only, while for using the headwalls in both sides of the circular culvert, the inclination angle of 60° is the best one. But, using the headwall in the D.S. side only has a negative impact on the hydraulic efficiency of the circular culvert.

Keywords:

Circular culvert efficiency, Inclined headwall, Outlet control, Culvert geometry.

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