Islamic Republic of Iran
Ministry of Energy

Khozestan Water & Power Authority
(KWPA CO.)
Application Research Department

Title:

Investigation on Flow Hydraulics & Riprap Stability around Spur Dike in ۹۰ Bend

Organization consultant:

Shahid Chamran University of Ahvaz

Research By

Seyed Mahmood Kashefipour
Javad Zahiri

Date
February ۲۰۱۴

Investigation on Flow Hydraulics & Riprap Stability around Spur Dike in ٩٠ Bend

Abstract

Bend outer bank region is always exposed to scour due to secondary flow. Different methods proposed to countermeasure the scour on outer bank. One of the most easiest and economic solution is using spur. As an obstacle in the flow, spur dikes increase the shear stress and scour. Studies about spur dikes show that the most critical point is spur nose. In this study riprap has been used for spur stability. Riprap design at the bend is much different from straight channel because of secondary flow and scouring pattern. This research investigated the effects of a spur length, diameter and the dimensions of riprap mattress, along with the main hydraulic parameters. Base on existing standards, the extent of protection required around a channel bend determined. After placing the spurs on the determining part, riprap placed around the spurs with different arrangement. In the experiments after adjustment the discharge, flow depth decreases until riprap failure occurs. Design equations were established based on a large experimental campaign to predict riprap failure in terms of the previous set of variables. Also in this study equations according to shields diagram developed to investigate the riprap stability around spurs at the bends. Proposed equations are compared with predictions of riprap stone size given by existing equations. This comparison shows that existing equations underestimate riprap stone size because ignoring secondary flow and its effect on flow pattern near spur dikes at the bend. This comparison shows the importance of this study in developing design equations for riprap stability around spur dikes at the bend. At the final suitable design proposed for spur standing at the bend for Felman Wells district and some of the Implemented design problems were discussed. Also proposed equations with efficient safety factor were used to estimate the optimized diameter and size of the riprap mattress around spurs in the study area.