

Applicability of Rational Formula for Larger Size Catchments in Highway Drainage Design

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The rational formula has been used for the peak flow estimation over 150 years and still remains as the most widely used flood estimation technique. The method is applied assuming that rainfall intensity and storm duration is uniform over the study area; storm duration is equal to the time of concentration of the catchment; and the runoff coefficient is constant during a storm. The assignment of precise upper limit on the catchment area for reliable application of rational method varies from country to country and among literatures. As many literatures indicated, it has been specified that rational method is appropriate for small catchments. However, the definition of small catchment is not consistent across practitioners.

The peak flow estimation of drainage structures would be a vital design consideration in evaluating the capacity adequacy of existing drainage system and to propose extension/new addition to the present drainage system, if it failed to satisfy the anticipated peak flow of a structure.

The hydrologic model determines the runoff that occurs following a particular rainfall event. The primary output from the hydrologic model is quantity, rate and timing of stream flow that results from rainfall events. The Hydrologic Modeling System (HEC-HMS) originally developed by the U.S. Army Corps of Engineers is used to simulate precipitation-runoff processes of dendritic watershed systems. It includes many of the well-known and well-applicable hydrologic methods to simulate rainfall-runoff processes in river basins.

The study focuses on the hydrologic design of cross drainage structures of road sections located in different hydrological and geographical zones in Sri Lanka. The topographic maps of 1:10,000 and 1:50,000 together with google terrain maps were used to identify the respective catchment areas and catchment characteristics. The peak flow corresponds to return periods of 25,50 and 100 years determined by the rational formula and comparison of

these values with the outputs derived through HEC – HMS model were then used for the determination of upper limit of the catchment area where the rational formula can be applied.

Key words: Rational Formula, HEC-HMS