AOGS 2006

An Experimental Study on the Estimation of Clogging Factors at Grate Inlets

JUNG-SOO KIM[1], JOON-HO LEE[1], SEI-EUI YOON[2], JONG-TAE LEE[3]

[1] *Researcher, Urban Flood Disaster Management Research Center, MOCT, Korea*

[2] *Professor, Dept. of Civil Eng. Kyonggi Univ. Suwon, Korea / syyoon@kyonggi. ac. kr*

[3] *Professor, Dept. of Civil Eng. Kyonggi Univ. Seoul, Korea / jtlee@kyonggi. ac. kr*

Urban storm water collection and conveyance systems are critical components of the urban infrastructures. During a storm event, street grate inlets are usually loaded with debris by the first-flush runoff volume. Grate inlets are subject to clogging effects. Selection of a clogging factor reflects the condition of debris and trash on the street. Effective interception area of grate inlets was decreased by clogging. It also decreased the interception capacity of grate inlets and increased the inundation area in street. Therefore, it is necessary to analyze the clogging characteristics and interception capacity change by clogging for appropriate design and management of grate inlets. Hydraulic experimental apparatus which can be changed the gutter transverse slopes(4-8%), longitudinal slopes(2-6%) of street and 8 different clogging conditions of grate inlet(40x50cm) was installed for this study. Reduction ratios of effective interception area caused clogging are supposed 10, 30, 50 and 70% and the locations of clogging are selected as flow and curb direction. With the consideration of a clogging effect, actual interception discharge(Qa)of a grate inlet can be expressed as the following numerical formula ; Qa = (1 - Co)Qi (Qi = intercepted discharge without clogging, Co = clogging factor). As the gutter transverse slope increases, the water spread width on the street decreases and the amount of water flow intensively centered on the curb direction. The change of the water spread width intensively influences on the interception capacity of a grate inlet. The interception capacities of grate inlets clogged curb direction are smaller than those of clogged flow one. As the longitudinal slopes of street increase, the interception capacities of grate inlet decrease due to splash-over phenomena. This is also observed at grate inlets which has no clogging condition. In general, 50% clogging factor was selected in street drainage design of single grate inlet. The 50% clogging factors in Seoul area are suggested 0.2∼0.5 in this paper. This clogging factors could be applied to decide the length of the grate inlet on a grade as: Le = (1-Co)L (Le = effective length, L = unit length of a grate inlet), because the interception capacity of a grate inlet on a grade is proportional to the grate inlet length. This study was supported by the 2003 Core Construction Technology Development Project(03-SANHAKYOUN-C01-01) through the Urban Flood Disaster Management Research Center in KICTTEP of MOCT KOREA.