Environmental Engineering and Management Journal *January 2014, Vol.13, No. 1, 181-190*
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

RELIABILITY MODEL FOR STORM SEWER

Hyuk Jae Kwon

Department of Civil Engineering, Cheongju University, Daesung-ro 298, Cheongju, 360-764, Korea
E-mail: hjkwon@cju.ac.kr; Phone: 82-43-229-8473; Fax: 82-43-229-8466

Abstract

Reliability model which can quantitatively calculate the probability of failure of storm sewer was developed in this study. Annual maximum rainfall intensities of six South-Korean cities were used to determine the statistical distribution for reliability model. From the results of reliability analysis, it was found that statistical distribution for the annual maximum rainfall intensities of six cities in Korea is well matched with Gumbel distribution. Rational equation was applied to determine the load of the storm sewer and Manning's and Darcy-Weisbach equations were applied to determine the capacity of storm sewer in reliability function. Reliability analysis was performed by calculation of probability of failure of storm sewer. It was assumed as the failure state if inflow is bigger than capacity of the storm sewer. Results of reliability analysis using Manning's and Darcy-Weisbach equations were compared and the probability of failure according to sewer diameter was calculated. Furthermore, the probability of failure of storm sewer located in Wonju and Chuncheon was calculated using the maximum rainfall intensity for 50-year return period. It was found that the probability of failure can be significantly increased if the sewer diameter is smaller than certain design value. Therefore, one of the best ways to reduce the probability of failure of storm sewer could be maintaining the original design diameter. Reliability model presented in this study can be applied to management, maintenance, and design of storm sewer.

Key words: annual maximum rainfall intensity, probability of failure, reliability analysis, storm sewer

Received: February, 2011; Revised final: June, 2012; Accepted: July, 2012