



Non - Vegetated Standard Bioretention Structure Hydrodynamic Soil Characterization For Ponding - Layer Optimum Thickness Determination With A Distinctive Urban - Region Rainfall Event In Bogota

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Aiming to propose a system, in accordance with Best Management Practices (BMP) kind of structures, specifically a standard bioretention system in Bogota city, and in order to apply the inverse solution methodology on Hydrus – 1D, it is mandatory to determine each θ_s ; θ_r ; α_n and k_s parameters in van Genuchten – Mualem function, without considering the hysteresis phenomenon, for a standard bioretention system composing soils, as well as required components and dimensions to implement the bioretention structure in Bogota.

First, a bioretention structure general dimensioning was carried out based on current urban landscaping regulations and recommendations given by the sewage – system service provider in Bogota city. Soil composing and design were performed after information gathering and previous investigation on bioretention systems dimensioning from different sources such as manuals.

To give an adequate interpretation of the vadose zone, a soil column experimental prototype was built to be able to control and measure the intervening parameters in the subsoil unidimensional flow description, such as capillary pressure, soil water saturation, inflow and outflow. Thirteen sensor - based devices were built to measure the inverse model required parameters. It is important to underline that all the designed instrumentation was based on low cost electronic development. In addition, the whole instrumentation system is controlled by an Arduino Mega PLC and was designed and built as a personal initiative by the author of this work. For signal processing and data capturing, a commercial Lab View version intuitive program was designed, to be able to create a user-friendly interface to make real-time sensor visualisation and control.

Finally, all the hydrodynamic characterisation for the studied soils was made through a Hydrus-1D inverse model and laboratory experimenting and obtained results. In addition, several direct models were run in order to determinate both bioretention structures' operation condition retention time and outflow. A storage layer in the base of the structure, which is made up by rocks to settle an appropriate retention volume, was suggested after computing model results. A Hydrus-1D direct model was also made as an application example for an urban zone in Bogota in order to observe the structure's behaviour and the runoff - peak mitigation percentage under normal functioning conditions, using hydrological data from the study region given by the water and sewage - service provider in Bogota city.