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SEDIMENT TRANSPORT EQUATIONS FOR SELF-CLEANSING SEWERS AT LIMIT OF DEPOSITION

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ABSTRACT

Several studies have been carried out to study the movement of sediments in pipes in recent years. Most of these concentrate on bed load movement. Only a few studies have been made to investigate the movement of sediments in pipes as suspended load. In this paper, a new equation predicting suspended load transport at the limit of deposition in pipes was derived based on a transport function for bed load transport.

INTRODUCTION

The concept of "self-cleansing" in designing storm water sewers could be classified according to the mode of sediment movement in pipes (Nalluri and Ab. Ghani 1995). First, sewers are designed to be self-cleansing such that sediments are expected to move continuously without deposition in a clean pipe hence sediment transport at the limit of deposition. Second, self-cleansing sewers are designed for the case of sediment movement over an optimum deposited loose bed.

Several studies have been carried out to study bed load transport either at the limit of deposition or over a deposited loose bed such as Mayerle (1988), May (1993) and Nalluri and Ab. Ghani (1994). Nalluri and Ab. Ghani (1994) suggested that sewers of diameter less than 1 m may be best designed at the limit of deposition. For larger diameters ($D > 1$ m), sewers may be designed with some bed deposition and there exists an optimum depth of sediment deposition in a sewer for a given flow condition.

However, only a few studies have been made to investigate suspended load transport in pipes. The studies by Macke (1982) and Arora et al (1984) at the limit of deposition are worth mentioning.

In this paper, a new equation was derived to predict suspended sediment transport at the limit of deposition in pipes based on a transport function for bed load transport (Ab. Ghani 1993).