AIN SHAMS UNIVERSITY
FACULTY OF EHGINEERING
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RELIABILITY OF EQUATIONS DESCRIBING TURBULENT WALL JETS DOWNSTREAM GATES

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STATEMENT

This dissertation is submitted to Ain Shams University for the M.Sc. Degree in Civil Engineering, Irrigation and Hydraulics.

The work included in this thesis is carried out by the author, at Ain Shams University, Faculty of Engineering, Irrigation and Hydraulics Department from October 2007 to January 2013.

No part of this thesis has been submitted for a degree or qualification at any other university or institute.

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Abstract

Wall Jets have a wide range of applications in hydraulic engineering especially in hydraulic structures such as gates, culverts and spillways .it has been a material for study from a very long time so a huge number of experiments (numerical, experimental and theoretical) have been performed concerning this issue so the analysis of these equations gains a great concern.

In this thesis a great concern is given to discussing the flow downstream wall jet and the scour caused by it since it has a great importance, wide range of applications and affect the stability of hydraulic structures and may cause loss of life. A description of different types of wall jets and simulation techniques is viewed in details in order to study three main topics.

The first topic is the validation of main equations describing the flow characteristics and scour caused by wall jets against a wide base of experimental data found in literature. Equations are identified, described and their parameters are clarified. Then equations are validated using experimental data and the limitations of each equation are presented in which it gives reasonable estimate since over estimation maybe considered as waste and under estimation may affect the stability of the structure and cause it to fail.

The second topic is applying sensitivity analysis technique for all used equations to define the most effective parameters for each equation.

The third topic is reliability simulation for some equations describing the scour caused by wall jet analyzed using Monte Carlo simulation technique. Different values of foundation dimensions are used in equations and analyzed using Monte Carlo technique to reach to most reasonable dimensions. Then a discussion of different cases for each equation is presented and future recommendations are mentioned for studying other judging factors to choose the most suitable dimensions.

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