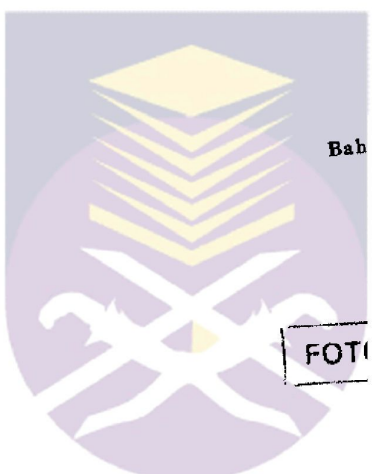
LOCAL SCOUR DUE TO SUBMERGED HORIZONTAL JET

by

SALIM BIN KETERON



A Report Submitted to the School Of Civil Engineering

MARA Institute of Technology, Shah Alam

In Partial Fulfilment of the Requirements for a degree in

Bachelor Of Engineering (Hons) (Civil)

November 1996

ACKNOWLEDGEMENT

The author would like to convey his heartiest thanks to his project advisor Encik Mohamad Shani Awalluddin, lecturer of School of Civil Engineering, MARA Institute of Technology for his fruitful advice for making this thesis a success.

The author would also like to express his deepest appreciation to all the technicians of the School of Civil Engineering for providing him with the necessary facilities required and the patience shown by them in coping with the preparation of this thesis.

Finally the author wish to express his special gratitude to his family and his classmates for giving him much encouragement, understanding and support during his period of study in ITM.

Salim bin Keteron

Nov 96

TABLE OF CONTENTS

		Page
ACKNOWLEDGEMENT		i
TABLE OF CONTENTS		ii
LIST OF SYMBOLS		v
LIST OF FIGURES		vii
LIST OF TABLES		viii
ABSTRACT		ix
1.0	INTRODUCTION	
	1.1 General	1
	1.2 Problem of Statement	2
	1.3 Objectives and Scope of Study	3
2.0	LITERATURE REVIEW	
	2.1 Introduction	4
	2.2 Local Scour	5
	2.3 The Wall Jet	7
	2.4 Scour by Jets	9
	2.5 Submerged Horizontal Jet Over Erodible Bed	12
	2.6 Local Scour Downstream of an Apron	13

ABSTRACT

This study is concerned with an experimental investigation of the scour phenomena and sediment transport due to a two-dimensional submerged horizontal jet of water issuing from a sluice gate and flowing over a rigid apron to an erodible bed.

This study was carried out in the wave flume in the Hydraulic Laboratory of The School of Civil Engineering, MARA Institute of Technology, Shah Alam .

Based on experimental data the scour characteristics have been tested using the formula developed by *Chatterjee* and *Ghosh* (1994) and then the comparison between the experimental result and the theory has been made based on *Chatterjee* and *Ghosh* (1994) equation as used in the time to reach equilibrium stage, the volume of scour at any time, the locations of maximum scour depth and peak of dune, and the variation of maximum scour depth with time.

1.0 INTRODUCTION

1.1 General

Water discharge through a sluice forms a jet that flows over an erodible bed after leaving a rigid apron. The high velocity of the jet causes high local shear stresses that generally exceeded the critical shear stress for incipient motion of the bed material, resulting in local scour at the downstream end of the rigid apron.

This causes an increase in the local flow depth; consequently, the shear stress acting over the bed will be reduced, which in turn will encourage the reduction in the scouring rate. The limiting extent of scour is reached when the shear stress acting over the bed is reduced to the critical shear stress of the bed material. The extent of the scour hole is strongly dependent on time. Initially the scour development with time is rapid, but it reduces as the equilibrium stage is reached.

A high discharge is usually passed through a hydraulic structure for a limited time, during which the local erosion rate is relatively high. Depending on the shape of the scour hole and the properties of the bed material, the structure in the vicinity of the scour hole may collapse. It is therefore necessary to study the whole process of scour phenomena, not just the identification of the probable maximum scour depth. It also of interest to know the sediment transport rate at the initial stage to allow the formulation of suitable scale modelling laws.