

A. A. UGINCHUS

# SEEPAGE THROUGH EARTH DAMS

(Raschet fil'tratsii cherez zemlyanye plotiny)

Gosenergoizdat  
Moskva 1960

Translated from Russian

Lawler  
73

Israel Program for Scientific Translations  
Jerusalem 1966

Copyright © 1966  
Israel Program for Scientific Translations Ltd.  
Second impression 1970  
IPST Cat. No. 1552

Translated by A. Barouch, M. Sc.  
Edited by Dipl.-Ing. T. Pelz. M. Sc.

Printed in Jerusalem by Keter Press  
Binding: Wiener Bindery Ltd., Jerusalem

Price \$ 5.00

## TABLE OF CONTENTS

FOREWORD . . . . .	vii
Part One. FUNDAMENTAL RELATIONSHIPS AND METHODS USED IN CALCULATING SEEPAGE THROUGH EARTH DAMS	
Chapter One. SEEPAGE-LINE EQUATION . . . . .	1
1. Deriving the seepage-line equation in a general form . . . . .	1
2. Mean gradient of the seepage flow in a section, and seepage-line gradient . . . . .	6
Chapter Two. THE ELECTRO-HYDRODYNAMIC SIMULATOR (EHS) FOR THE STUDY OF SEEPAGE THROUGH EARTH DAMS . . . . .	8
3. Fundamentals . . . . .	8
4. Description of the EHS installation used for the experiments . . . . .	10
5. Procedure of experiments . . . . .	12
6. Processing of experimental data . . . . .	13
Chapter Three. APPLICATION OF THE METHOD OF PARTS TO THE CALCULATION OF SEEPAGE THROUGH EARTH DAMS . . . . .	17
7. Calculating the seepage through the upstream part of the dam . . . . .	17
8. Calculating the seepage through downstream part of the dam . . . . .	23
Part Two. SEEPAGE THROUGH EARTH DAMS ON IMPERVIOUS FOUNDATIONS . . . . .	
Chapter Four. HOMOGENEOUS EARTH DAMS WITH EMPTY TAILRACES . . . . .	28
9. Homogeneous earth dams with drainage blanket . . . . .	28
10. Determining the dimensions of the drainage blanket . . . . .	34
11. Determining the effective part of the drainage blanket . . . . .	40
12. Homogeneous earth dams with toe drains . . . . .	43
13. Determining the dimensions of rock toe drains . . . . .	45
14. Homogeneous earth dams without internal drainage . . . . .	48
15. Determining the dimensions of the insulating layer . . . . .	52

Chapter Five.	HOMOGENEOUS EARTH DAMS WITH WATER IN THE TAILRACE . . . . .	54
16.	Homogeneous earth dams without drainage . . . . .	54
17.	Homogeneous earth dams with drainage blanket . . . . .	61
18.	Homogeneous earth dams with drainage prisms . . . . .	71
Chapter Six	COMPOSITE DAMS . . . . .	75
19.	General information . . . . .	75
20.	Determination of permeability of facing and core . . . . .	76
21.	Relationships between the permeability coefficients of facing and dam-body soil . . . . .	79
22.	Seepage calculations for earth dams with facings . . . . .	84
23.	Seepage calculations for earth dams with core . . . . .	91
24.	Seepage calculations for dams of mixed type . . . . .	94
Part Three. SEEPAGE THROUGH EARTH DAMS ON PERVIOUS FOUNDATIONS . . . . .		
Chapter Seven.	DAMS WITH FACINGS AND APRONS . . . . .	96
25.	General observations of the seepage through earth dams erected on pervious foundations . . . . .	96
26.	Determining the permeability of aprons. . . . .	98
27.	Seepage through earth dams with pervious aprons and . . . facings . . . . .	105
28.	Determining the length of the apron . . . . .	113
29.	Determining the thickness of the apron . . . . .	114
30.	Seepage through earth dams with highly impervious aprons and facings. . . . .	115
31.	Seepage through dams with short aprons . . . . .	118
Chapter Eight.	DAMS WITH FACING AND CUTOFF . . . . .	122
32.	Seepage through earth dams with facings and cutoffs . . . . .	122
33.	Seepage through earth dams with facings and partial cutoffs . . . . .	124
Bibliography . . . . .		130
Appendixes I—II . . . . .		131