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RETAINING WALLS

Volume II

Study of Passive Resistance in Foundation Structures

by

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1. Preface

Volume I, entitled "Retaining Walls, Anchorages and Sheet Piling", showed how the values of the **maximum thrust** and of the **minimum passive** resistance exerted upon, or developed by, retaining walls in general could be calculated.

These optimum values correspond to the **"at rest"** state of equilibrium of the soil, this being **the only state compatible with proper stability of retaining structures.**

Nevertheless, in special cases where such structures undergo displacements whereby they push back the retained soil upon itself, it used to be known merely that the magnitude of the passive resistance reaction developed by that soil would increase rapidly and considerably, though the relationship between the displacements and the stresses resulting therefrom had never been clearly established.

The extremely accurate experiments reported in Volume II have revealed the **deformation relationship** for a granular material under loading whereby it develops **translatory passive resistance** or **rotational passive resistance.** This deformation is defined by a **linear function of the passive resistance coefficient** in the elasto-plastic stage of equilibrium of the material.

The special problem presented by the equilibrium of soil developing passive resistance is therefore unambiguously solved, for it is henceforth possible to know the displacements that a retaining structure would undergo, depending on the value of the passive resistance coefficient corresponding to the equilibrium of the retained material tending to be pushed back upon itself by forces of determinate magnitude.

The information yielded by the researches reported in this book is thus directly applicable to the design of retaining walls, sheet piling, diaphragm walls, etc.

The information presented in this book embodies the results of our personal and unbiased efforts. It necessitated upwards of a thousand experiments of various kinds, performed with equipment designed entirely by ourselves and without any financial assistance from outside sources.

Nevertheless, despite the effort and expense involved, we carried out a properly planned experimental program that enabled us to ascertain and interpret the passive resistance phenomena in a most exhaustive manner.

Thus we have devoted, separate chapters to the effect of scale in models, to dilatancy, to the effect of displacement of the retaining wall in its own plane, to the surface condition of the wall, etc.

As regards this last-mentioned point, we knowingly confined ourselves to what was apparently a small displacement as soon as it was found to be sufficient to reveal that the surface condition of the wall was of no influence on the passive resistance at rest, while at the same time confirming the validity of the linear relationship between the deformations and the forces which has been proposed by us with regard to the phenomena of passive resistance.

This preliminary notice will thus have served to inform our readers of the scope and conditions of the present treatise which carries these researches to their proper conclusion in providing the interpretation of the phenomena of translatory and of rotational passive resistance.

Paris,
January 1976

Marcel L. Reimbert
Andrew M. Reimbert

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2. Introduction

The experiments forming the subject of the present Volume II were carried out with the aid of procedures significantly different from those employed in the experimental work concerned with the measurement of thrust and passive resistance "at rest", as reported in Volume I.

The reader's attention is more particularly directed to the fact that the experiments relating to passive resistance with displacement of the retaining wall (as represented by a diaphragm in the investigations) provide rigorous confirmation of the previously proposed formulas for defining the state of equilibrium at rest of granular materials having a horizontal or an inclined top surface, with or without surcharge.

The information yielded by these researches as a whole thus thoroughly covers the whole range of the subject and provides a complete cross-check of all the formulas.