1

Introduction

The topic of earth pressure is considered one of the oldest and most extensive chapters in soil mechanics and foundation engineering. It is also one of the three pillars of structural engineering together with arch theory and beam theory. The first written sources, dating back to Vitruvius, are more than 2000 years old and therefore much older than the well-known theories of Coulomb (1773/1776) or Rankine (1857). In the first and sixth volume of his ten books, Vitruvius deals with the mode of action of earth pressure on retaining walls and proposes buttresses. Vauban, one of the greatest engineers in history, already published design tables for retaining walls with heights of up to 15 m in 1684, which cannot be bettered even today. The development of the earth pressure theory is described in detail in chapter 2 which is based on the extended edition of "The History of the Theory of Structures. Searching for Equilibrium" by Kurrer (2018). The present book can only include a limited selection of current design methods. The aim of the book is to provide a set of work instructions for foundation engineers and structural engineers in construction companies, engineering consultancies and in design departments, but also for students. In order to further theoretical understanding, the essential principles for determining earth pressure are initially presented in chapter 3. Chapters 4 to 12 contain the most important methods of determining active and passive earth pressure as well as at-rest earth pressure. In chapters 7 and 8, the spatial effects of earth pressure are taken into account. One concern of this book is to give a short overview of non-everyday questions and to refer to further literature (see chapter 14). In recent years, the displacement dependency of earth pressure has increasingly come into view. This applies not only to passive but also to active cases (see chapter 15). The book offers also instructions for practical application in chapter 16 and is supplemented by earth pressure tables for the most important basic cases.

Many questions were submitted to the DIN Committee "calculation methods", and a selection of these is discussed in the commentary to DIN 4085 in chapter 17. In the last section of this chapter, references are provided to the examples in the supplement to DIN 4085, which was published in December 2018.

The history of earth pressure theory in chapter 2 includes a few selected short biographies of scientists and engineers working in the field who have taken up and developed the subject over the centuries, see chapter 18. The book is supplemented by two appendices with terms, symbols and indices (Appendix A) and

earth pressure tables in Appendix B. For historical reasons, the current terms and formulas in chapters 3 to 17 and in the Appendices may differ from the original terms in chapter 2.

References

Coulomb, C.A. (1773/1776). Essai sur une application des règles des Maximis et Minimis à quelques Problèmes de statique relatifs à l'Architecture. In: *Mémoires de mathématique & de physique, présentés à l'Académie Royale des Sciences par divers savans*, Vol. 7, année 1773, 343–382. Paris.

Kurrer, K.-E. (2018). *The History of the Theory of Structures. Searching for Equilibrium*. Construction History Series (Ed. by K.-E. Kurrer and W. Lorenz). Berlin: Ernst & Sohn.

Rankine, W.J.M. (1857). On the Stability of Loose Earth. *Philosophical Transactions of the London Royal Society* 147: 9–27.