

BUILDING ON SINKHOLES: DESIGN AND CONSTRUCTION OF FOUNDATIONS IN KARST TERRAIN

By George F. Sowers

ASCE, New York; 1996; 202 pages.

Building on Sinkholes "is written for engineers and geologists, in addition to other professionals who work together to solve sinkhole problems." The book provides the reader with a fundamental understanding of the mechanisms of sinkhole formation in limestone (or karst) terrains and the methods for overcoming sinkhole-related failures. It reflects the experience of the author more than a literature survey. About 100 black-and-white photographs and drawings of excellent quality are well used to convey technical concepts. Math is limited to a few basic equations.

The soft cover book is clearly written and well organized. It is divided into nine chapters that can be grouped into five parts. Chapter One introduces the problems of building on sinkholes and defines basic terminology to be used throughout the book.

The second part of the book, Chapters Two through Four, provides the necessary technical background of geology to define the problems that occur in limestone terrains. Chapter Two reviews the processes of limestone formation and solution, and their effect on strength, porosity, compressibility, and geometry of the rock mass and the residual soil that accumulates above the rock mass. Chapter Three describes the mechanisms of overburden subsidence and sinkhole development. A short list of sinkhole terminology is provided for the nonexpert. Similarities of sinkholes over solutioned limestone and those over openings in other rock formations, such as lava, as well as over man-made openings, such as mines and sewers, are presented. Chapter Four discusses the nature of the ground-water movements that occur in limestone deposits. The author clearly points out in this chapter, and throughout the book, that most sinkhole activity is related to ground-water depletion and increases in surface water infiltration.

Chapter Five reviews the objectives of a site investigation and the techniques that are most useful for characterizing limestone deposits. The techniques discussed include remote sens-

ing, on-site reconnaissance, borehole and test-pit exploration, geophysical exploration, ground-water exploration, mapping, and modeling.

The next three chapters (Chapters Six through Eight) examine design and construction methods appropriate for building structures in areas where sinkhole activity is liable to occur. Chapter six deals with site preparation and earthwork. Remedial measures to improve or correct inherent defects and weaknesses of the soil and rock are described in detail. In addition, the author provides a valuable list of procedures for avoiding delays and conflicts in resolving unforeseen problems in earthwork construction. Design considerations and alternatives for foundations supported on overburden soils and on limestone are discussed in Chapters Seven and Eight, respectively.

The book concludes with a brief discussion of risk and risk acceptance, Chapter Nine. The author states that even with scientific studies, responsible engineering, and careful construction enforced by laws all risk cannot be eliminated.

The bibliography and references contains 42 citations.

One of the most valuable aspects of the book is the use of case histories to illustrate and reinforce the principles being discussed in each chapter. Over 23 cases are skillfully woven into the text. They are enhanced by clear photographs and drawings. This style of writing makes for interesting reading and provides the reader with a virtual field trip experience.

I believe the author has succeeded admirably in his attempt to provide a book for such a diverse audience. The book is an excellent guide to planning, designing, and constructing in areas prone to sinkhole development. I am confident that all but the most experienced engineer and geologist (who work in limestone terrains) can benefit from the experiences and insights shared. It is a "must read" book for the project owner and architect.

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