The Aggregates Handbook

SECOND EDITION

The National Stone, Sand and Gravel Association
Alexandria, VA

Library of Congress Catalog Card Number: 91-67322

Printed in the United States of America by Sheridan Books, Inc., a Sheridan Group Company.

Design and composition by Mercury Publishing Services.

ISBN: 978-0-9889950-0-0

Library of Congress Catalog Card Number: 91-67322

Special Acknowledgements

As stated in 1991 in the original Aggregate Handbook, leaders in the aggregates industry have recognized that a comprehensive, practical and professional publication was needed to guide the growth of the industry and the proper applications of its products in engineering design, construction and other uses. This stands true today. This second edition incorporates new and updated material, including rapidly changing technologies in the aggregates industry and expanded coverage of developments in sustainability, production technology, safety, transportation, design, technology standards and industry trends.

We would like to extend our special appreciation to the Aggregate Foundation for Technology, Research and Education for their support of this project. Our thanks are extended to an outstanding group of authors, editors and contributors, representing a broad range of expertise, who have contributed so generously of their time and experience to the success of this publication.

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Table of Contents

Chapter 1: Introduction to the Aggregates Industry

1.1 Objectives of the Handbook 1-2
1.2 Organization of Material 1-2
1.3 Definitions of Terms 1-3
1.4 Size of the Aggregates Industry 1-4
1.5 Economic Importance 1-4
1.6 Historical Perspective 1-5
1.7 Trends 1-10

Chapter 2: Basic Properties of Aggregates

2.1 Introduction 2-2
2.2 Functions of a Construction System 2-3
2.3 Definition and Discussion of Aggregates Properties 2-6
2.4 Physical Properties of Common Aggregates 2-18
2.5 Measurement of Aggregates Properties 2-19
2.6 Blending of Aggregates 2-50
Appendix ASTM and AASHTO Standards for Aggregates 2-56

Chapter 3: Geology and Exploration

3.1 Introduction 3-2
3.2 The Occurrence of Natural Aggregates Resources 3-2
3.3 New Trends 3-13
3.4 Variations in Aggregates Quality 3-13
3.5 Mine Related Computer Software 3-18
3.6 Exploration and Evaluation 3-19
3.7 Rock Quality Issues 3-44
3.8 Exploration and Evaluation of Potential Reserves 3-45
3.9 Summary 3-46

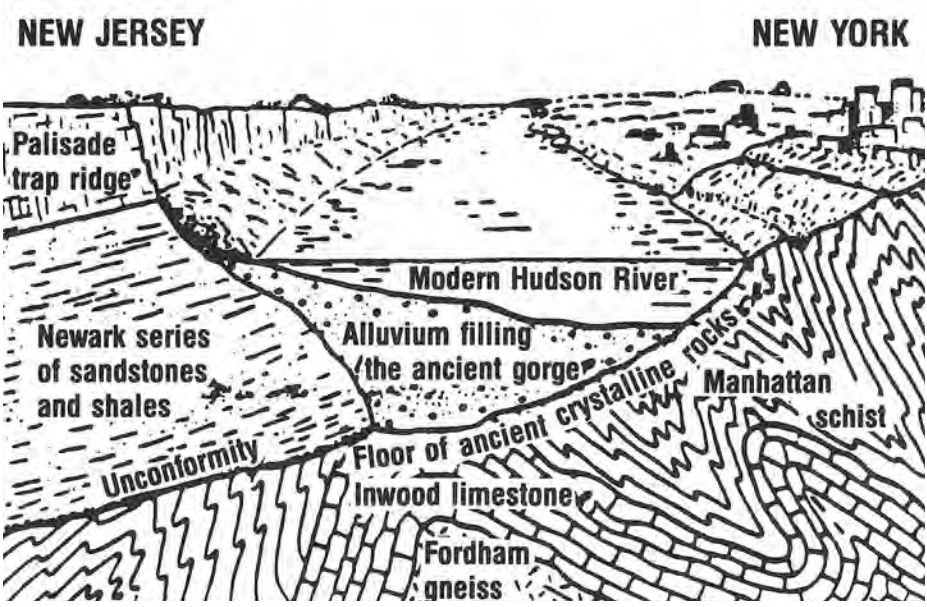

Figure 3.6 Complex Geology of the New York City Area[12].

Base Maps: Base maps of properties can be as simple as property boundary maps. They may be as complex as topographic maps made at a scale of 100- or even 50-ft-to-the-inch from specially flown stereographic aerial photographs. When the geology is complex and quality control difficult (Figure 3.6), or when engineering problems are severe, preparation of a geologic map is prudent. The selected scale and contour interval are primarily a function of the complexity of the topography and the amount of details that need to be included on the map.

The techniques for geologic mapping and interpretation are not discussed here because of their complexity. Any mapping should be performed by geologists familiar with the requirements of the aggregates industry. Detailed discussions of mapping are given elsewhere.[13]

Methods of Obtaining Samples

Introduction: Systematic sampling of the aggregates source is basic to determining reserves. The nature and trend of the layers must be known well enough so that the position of each sample relative to the layers that ultimately will be mined is understood. All pits, drill sites, or other sampling locations should be plotted on maps. Sampling should be sufficient to allow the evaluation of the quality, quantity and configuration of all layers or zones to be mined. When a layer is sampled for testing, the entire layer intersected by drilling, trenching or other methods should be sampled. Enough samples should be taken of each zone so that its critical characteristics are known. In addition, multiple sampling of zones allows for checking on the quality of the test results, i.e., test results for a particular zone should be similar. Duplicate samples

routinely should be sent to testing laboratories as a further check on laboratory results. Finally, assurance should be obtained at an early stage that the test results received will be essentially the same results that the specifying governmental agency in whose jurisdiction the producer markets his products will obtain on the same samples. Sampling techniques also are described in Chapter 18.

Types of Samples: The types of samples commonly taken are as follows:

1. *Grab Samples.* Grab samples are preliminary only and rarely can be considered typical of a deposit. Grab samples can be taken from pits, off outcrops, out of cores, from quarry or pit walls, stone product piles, or muck piles. In each case, the person performing the sampling should attempt to obtain typical, representative material. To obtain the best sample from a product pile, the sampler should follow procedures outlined in ASTM D75-8714 because piles tend to segregate. The sampler should realize, however, that even under the best of circumstances, grab samples rarely are representative of the deposit. If properly taken, grab samples may be representative of a muck or product pile.

2. *Shot Samples.* In some cases, rock is shot from an outcrop or from a quarry face for testing purposes. If only some of the rock is sampled, it must be considered a grab sample. It is preferential to take all of the shot material for testing purposes. Still, a sample of shot material, large though it may be, is probably representative of only a limited part of a deposit. The degree to which it is likely to be representative of the whole or of a segment of the deposit should be determined by an experienced geologist.

3. *Pit Samples.* Samples of sand and gravel can be taken from excavated pits. Pit samples are relatively inexpensive to take and several samples can be obtained in a day. Care should be taken to sample around and well into each pile of excavated material. The person performing the sampling should observe and, preferably, log the pit layers to be certain that whatever material is taken reasonably represents the gradations of material to be mined. Any sample obtained from a pit is likely to be leached of cementing carbonate minerals and therefore may not fairly represent the quality of the resource at depth.

4. *Core Drilling.* A typical core drilling set-up is shown in Figure 3.7. If possible, cores should be taken approximately perpendicular to the direction of rock layering. The size of core that is taken is a compromise between cost, recoverability, quantity and ease of handling. Although cores may be as small as ⅝ inch or as large as 36 inches in diameter, the most frequently used sizes are NX (2⅛ inch core diameter) or NQ (2-inch core diameter). The spacing and number of core drill holes are dependent on the complexity of a deposit and on the purpose of the drilling. A typical spacing for core holes is 400-foot centers or one hole per four acres. But when rock is homogeneous over large areas a wider spacing can sometimes be justified. Great geologic complexity may, in other cases, require much closer spacing.

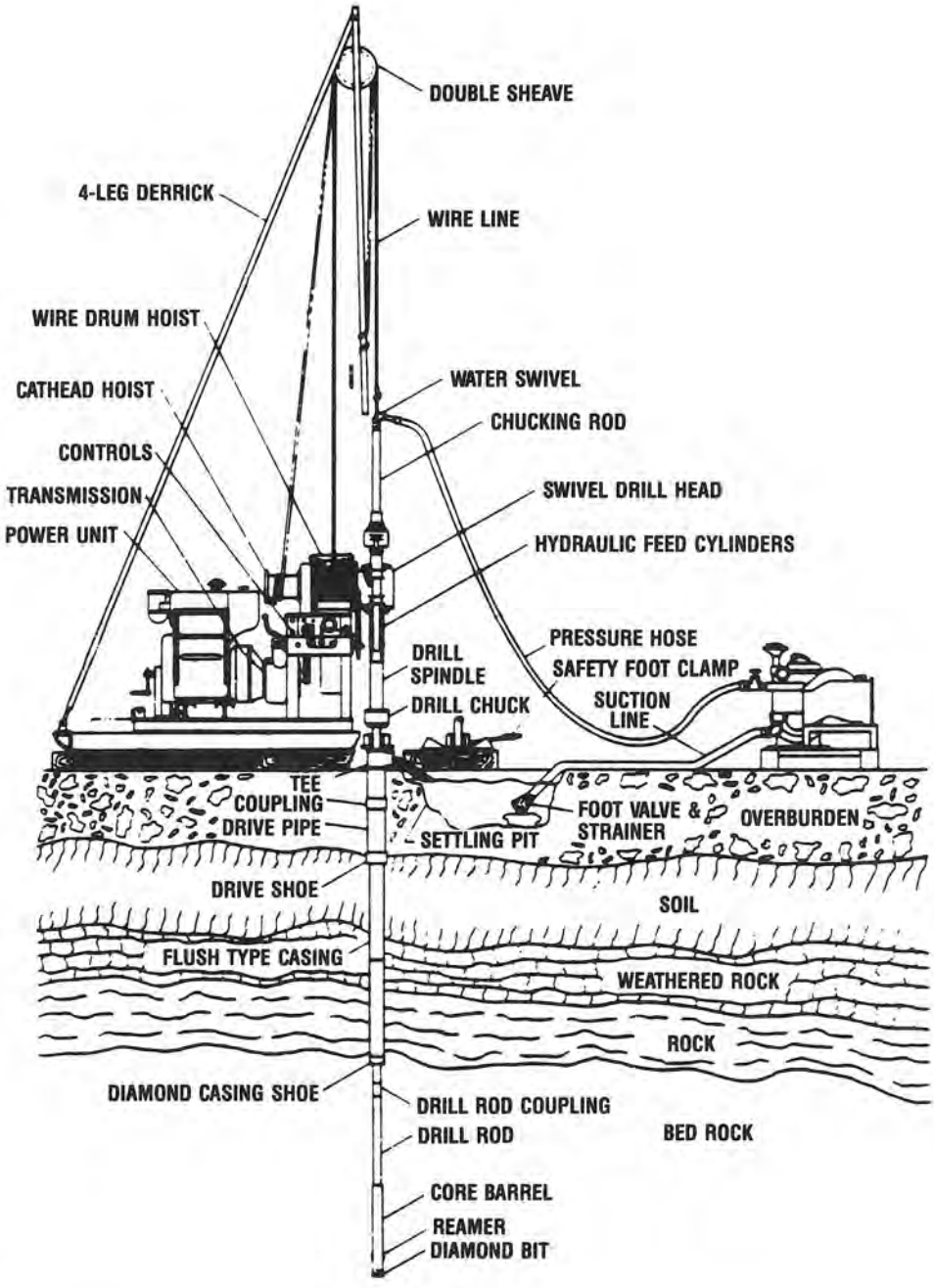

Figure 3.7 Schematic of Typical Diamond Core Drill Rig[15].