

BOOK REVIEW

Reuben H. KAROL: Chemical Grouting

Marcel Dekker, Inc. 1983. 327 pp.

Many projects involve underground construction work providing for foundations, basements, tunnels, shafts, etc. Whenever excavations go below groundwater surface, contractors generally make provisions to handle water problems, which — during and after construction — may cause intolerable inconveniences. The most widely used methods of groundwater control are drainage, pumping, caulking, use of compressed air, well pointing and making slurry trenches depending on the structure and composition of soil, the kind of construction and the size of the area to be dewatered. An interesting and special way of controlling the movement of ground and groundwater is grouting in which the grout replaces the natural fluids in the formation voids.

The author — one of the foremost experts in chemical grouting — in the first chapter gives the basic definitions and some insight into the history of (chemical) grouting. Grout — in general — is a material that is injected into a soil or rock formation in order to alter its physical characteristics. Cement grouts has long been used e.g. to treat dam foundation sites. The so-called chemical grouts — contrary to cement grouts — do not contain suspended particles, they are essentially solutions or liquids. The first — and for a long time the only — chemical grout used was sodium silicate together with different coagulants. The development of the field was accelerated considerably by the advances in polymer chemistry. The use of organic monomer containing liquids, prepolymers, low molecular weight resin condensates, beside the silicates, increased rapidly. In the meantime some new problems arose: some of the new materials can cause environmental pollution and health hazards.

In the next chapter, those properties of soil and rock formations are discussed that affect their groutability. The most important one is the permeability, which is related to porosity and pore size.

After a brief summary of the fundamental theoretical considerations comes the possibly most important chapter of the book. It first lists the decisive properties of chemical grouts, going into details about their penetrability and the strength of the soil formations stabilized with them. Then the author characterizes the most important families of chemical grouts (mentioning the available commercial grades): the sodium silicate formulations, acrylamides, ligno-sulfonates, phenoplasts and aminoplasts and some other materials. The survey is a detailed and critical one, taking all the important features into consideration. This part can really serve as a useful guide for anyone who wants to use the technique.

The next two chapters (5th and 6th) deal with the ways of having a gel form in the desired location and the mechanical items a grouter uses to place the materials into a formation.

Chapter 7 groups the field tests that often give more direct information than soil exploration and laboratory tests. These can answer the question whether or not a certain formation will accept grout; the existence of flow channels can also be verified, etc.

The author then discusses the procedures applied to stop seepage and to make barriers to groundwater flow by grouting (the so-called grout curtains) — the first of the two major purposes for grouting. The second purpose, adding shear strength to a formation, is dealt with in Chapter 10. This additional strength prevents the movement of material from under loaded zones and increases the bearing capacity and slope stability of formations.

In certain cases, like tunnel and shaft grouting, both of the above mentioned main purposes must be served. The discussion of the applied procedures is illustrated by several case histories.

Some special applications of chemical grouting follow in Chapter 12, the most interesting one being the internal sealing of sewer lines to control infiltration of groundwater that overloads treatment plants.

This excellent reference concludes with a survey of the recent research and development works concerning new grouting materials and grouting application techniques.

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