

Some new developments in the design rules for coastal structures relation with the new Rock Manual

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Introduction

In 1991 CUR in the Netherlands and CIRIA in the UK have published the "manual on the use of rock in coastal engineering", usually referred to as the "Rock Manual". This book of 600 pages gave an overview of the state of the art regarding the design of rock structures along coasts. In 1995 CUR published a adapted version of this book, also containing information on closure works and rock structures along rivers. Although the information in these books is not outdated, there was a general feeling that these reference books were not complete any more given the latest developments in the design of coastal structures. Therefore CUR, CIRIA, and also the French Ministry of Public Works (CetMef) have decided to produce an update of these books. The new Rock Manual will be available in 2006, will contain approx. 1200 pages and will be published in English and in French.

New in the Rock Manual

The overall structure of the Rock Manual is the same as the structure of the version of 1995. However, a number of subject have been adapted considerably. Notably chapter 3 on materials and chapter 5 on design rules have been brought up to date. In the chapter on marine structures special attention has been paid now to the dynamic and the Icelandic type of breakwater. New additions are sections related to ice loads and design in environments with strong winters. Regarding the soil mechanical requirements a link has been made with the relevant Eurocodes. Also the concrete armour units (notably the Accropode, the Xbloc and the Core-Loc) are included in this book, although they are not really rock. The section on mathematical models has been updated completely. Because the Rock Manual is not a manual for the use of mathematical models, the manual focuses especially on how the results from calculations with modern mathematical models can be used in the design of rock structures in an hydraulic environment. The section on management and maintenance in the 1995 version was rather academic, in the 2006 version a more practical approach has been selected.

Hydraulic boundary conditions

In recent years quite some work has been done on run-up on and overtopping over coastal structures. This has resulted in adapted equations for run-up and new equations for overtopping of breakwaters and other coastal structures. Especially the results of recent European funded programs on run-up and overtopping have resulted in quite some knowledge. The added value of

this program can be found in the fact that it is not only supported by small-scale but also by large-scale and prototype measurements of overtopping of structures during extreme conditions.

Materials

The chapter on materials has been revised completely. The main reason is the publication of European Standard EN13383, Armourstone. In this standard a number of standard gradings have been defined, together with the properties of the rock, like shape. But also the physical requirements are defined, like Resistance to Breakage and Wear, the chemical requirements, and the durability. A system has been described in such a way that the client described the required qualities, and the producer of the rock guarantees that the delivered stone is according to these requirements. This makes that designers may use rather standardized qualities, and that not all batches of rock have to be tested individually. In the Rock Manual also special attention is paid to the block integrity. Because concrete elements are also included in the new manual, the chapter on materials gives also some guidance on the requirements for the concrete quality in coastal structures.

Design rules

A number of structures are described in the new rock manually, which are not or hardly mentioned in the previous versions. Especially the near-bed structures, the submerged structures and the low crested structures are worked out in detail and new design formulae for these structures are presented. This is all based on the result of research in the last ten years.

A new chapter has been included on the design of concrete elements. In the previous versions concrete armour units were not discussed, but in the 2006 version of the manual special attention will also be paid to the design using large concrete elements on breakwaters.

New design formula have been developed recently on the stability of units on the crest and at the rear slope of breakwaters. This allows a designer to optimise also these parts of a breakwaters. Design rules for ice loads on rock and concrete elements are included.