

Technical Summary FD2401

Coastal Rock Structures on Unprepared Foundations

Background to R&D Project

Rock armoured structures are used frequently around the UK coast for protection against the effects of waves and currents, or to control or modify beach movements. In many instances, armoured structures designed to standard codes or guidance include layers of different sizes of rock armour, and these structures may also require removal of local beach material and/or addition of ground improvement or filter materials to form the structure foundation. Yet some armoured structures have been installed around the UK without many of these features, offering simplifications in material supply and construction, and possibly at significant savings in cost. Whilst some of these simpler structures have suffered damage in service, many of them appear to have performed well. It may therefore be deduced that for some coastal rock structures the performance actually required to discharge their primary function is rather less than the performance achieved by using standard design procedures. This project was a scoping study to address the viability of constructing coastal rock structures on unprepared foundations without the use of underlayers, and/or with minimal preparation.

R&D Outputs and their Use

The R&D report is intended for coastal engineers and managers, and also for those involved in funding and commissioning coastal R&D. The report discusses a series of questions crystallizing the issues affecting the use of coastal rock structures on unprepared foundations,

- What is implied by “innovative” or “unconventional” construction in the context of this project?
- Why do conventional designs include prepared foundations and layers?
- Does omission or simplification of foundations or layers save time, reduce cost, or provide other benefits?
- Can such structures be built safely/reliably?
- Can such structures be designed in accordance with present guidance?
- Is research information available to support the (future) development of improved design guidance for innovative structures?
- Is there any relevant ongoing research?
- Are there significant environmental/sustainability issues?

The report then reviews past experience and present practice in the use of rock in UK coastal defences. A major component of this part of the study was an Industry Workshop, and a copy of each of the presentations made at the Workshop is included as an Appendix to the report. Finally, recommendations are made for future research leading to practical guidance on the design and management of coastal rock structures on unprepared foundations.

Results of R&D Project

The study arrived at the following main conclusions:

- It is apparent that the presently available design guidance does not represent best practice in all situations and may lead to less economic defences being constructed.
- Design criteria for rock structures are often not consistent with those of other elements of coastal defence schemes such as beach nourishment. This may lead to substantially increased cost and reduced monitoring activities.

- There are disparities in design practices adopted by different groups of design engineers, particularly between consultants and Maritime Authority engineers.
- It is apparent that there are locations at which it is appropriate and economic to use innovative coastal rock structures with limited or no underlayers/foundations.

For future R&D, the study recommended a short-term project to collate, appraise and disseminate existing experience in the design and use of less conventional rock structures. That project however will not directly improve analytical methods or models, nor give quantifiable estimates of design life. The study therefore also recommended longer-term R&D to improve knowledge and understanding of various processes at and around rock structures, including:

- effects of structure configuration and composition on the overall hydrodynamics
- flows/pressure conditions at the surface of, between and within porous mounds/layers
- movement of (finer) materials through porous mounds/layers
- structural/geotechnical responses of mounds and slopes to flows/pressures and sediment movement.

This R&D Technical Summary relates to R&D Project FD2401 and the following output:

- **Innovation in the use of coastal rock protection. Results of a research scoping study.** Report SR 577, HR Wallingford, September 2000

Publication Internal Status: Released internally External Status: Released to public domain

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The above outputs are available on the Defra website http://www2.defra.gov.uk/research/Project_Data. Copies are held by all EA Regional Information Centres and can be purchased from the EA's R&D Dissemination Centre, c/o WRc, Frankland Road, Blagrove, Swindon, Wiltshire SN5 8YF (Tel: (+44) 1793-865012; Fax: (+44) 1793-514562; email: publications@wrplc.co.uk).

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