

ENVIRONMENTAL DESIGN

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Engineering Properties of Coral Reefs

PERIOD: May 1979 - Feb 1980
ORGANIZATION: James Cook University,
Department of Civil and Systems Engineering

PROJECT LEADER: Dr H. Bock

PROJECT OFFICER: Mr R. Kenchington

SUPERVISOR: Mr R. Kenchington

FINANCIAL SUPPORT: GBRMPA - \$2,600

OBJECTIVES

To increase knowledge of the near-surface geotechnical properties of coral reefs, down to a depth of about 25m. To increase knowledge on the principal distribution of the dominant geotechnical units (coral limestone, sand and cavities) over the area of an individual reef.

IMPLICATIONS/MANAGEMENT NEEDS

The project will provide valuable information for the development of a code of practice for the design of structures for erection on coral reefs. In the past, problems have been encountered when founding man-made structures such as lighthouses or research platforms on coral reefs.

METHODOLOGY

Three techniques were applied: diamond drilling, dynamic penetration and seismic refraction.

Keeper Reef (approx. 60km north-east of Townsville) was systematically investigated along a section running from the outer reef into the lagoon.

STATUS

The project has been completed.

It was found that dynamic penetration is the best method of exploring the near-surface structure of coral reefs in detail.

With respect to the second objective, it was found that there are characteristic changes in the near-surface reef structure in both horizontal and vertical directions.

Papers on the research have been published:

Bock, H. and Brown, E.T. 1980. Foundation properties of coral reefs - site investigation techniques and preliminary results. Proceedings International Conference on Structural Foundations on Rock, Sydney 7-9 May, 1980. Vol.1, pp.43-52, Rotterdam (Balkema).

Bock, H. 1981. Founding structures on coral reefs. Proceedings Environmental Engineering Conference, Townsville, pp.51-56, Barton A.C.T. (Institute of Engineers, Australia).

LOCALITY: Keeper Reef (80km north-east of Townsville).

Review of Construction and Design Principles for Man-made Structures on Coral Reefs

PERIOD: 1979

ORGANIZATION: James Cook University, Engineering Department

PROJECT LEADER: Mr G. Bulgarelli

PROJECT OFFICER: Dr W. Craik

SUPERVISOR: Dr H. Bock

FINANCIAL SUPPORT: GBRMPA Augmentative Research Grant - \$437

OBJECTIVES

To present the state of the art concerning the construction of man-made structures on coral reefs and particularly the Great Barrier Reef.

IMPLICATIONS/MANAGEMENT NEEDS

This study is designed to provide important background information for the development of a code of practice for the design of structures for erection on coral reefs.

METHODOLOGY

A review of the literature on the subject was made. The information was updated by contacting relevant Government Institutions.

STATUS

The project has been completed.

When planning a major engineering structure a thorough site investigation is probably the single most important step. Of the different site investigation techniques applicable for coral reefs, penetrometer tests seem to be best.

Piles are the most suitable foundation for a structure on a coral reef. Prestressed concrete piles have application for large structures. The high cost involved in construction on a coral reef can lead to great flexibility in the foundation design. (The increased cost of driving piles deeper, for example, is negligible). Ideally, the engineer should be on site when the piles are driven so he can determine if any variations in design are necessary.

Full advantage should be taken of prefabricated sections to keep actual on-site construction to a minimum. Corrosion resistant materials should be used wherever possible.