

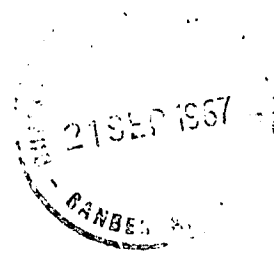
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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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PRELIMINARY REPORT ON THE
EARTHQUAKE PROBLEMS IN THE
TERRITORY OF PAPUA AND
NEW GUINEA, INCLUDING
STRONG-MOTION RECORDING

by

R.I. SKINNER

*(Engineer Seismologist, Physics Engineering Laboratory,
Department of Scientific and Industrial Research,
New Zealand)*

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1. INTRODUCTION

A general picture of the earthquake engineering problems in the Territory of Papua and New Guinea was gained during a comprehensive tour from the 13th to the 26th August 1967. A great contribution to the success of the tour was made by the local and expert knowledge of Dr D. Denham who accompanied me throughout the tour and of Mr A.J. Wight, Commonwealth Department of Works, and Mr J. Read, Engineering Geologist who accompanied me for much of the tour.

2. INSTALLATION OF ACCELEROGRAPHS

Suitable sites were selected for two accelerographs for the Upper Ramu dam site. Two MO2 accelerographs were installed near Kieta, Bougainville, for C.R.A. The methods of installation and maintenance were demonstrated to Dr Denham and to Mr John Donkley a technical officer employed by C.R.A. The demonstration MO2 accelerograph was shown to Mr Ian Brooks and to some members of the staff at the Geophysical Observatory, Port Moresby.

3. TOUR OF THE TERRITORY

The timetable was adhered to in detail, with inspection of the various works and sites as planned, except for a slight curtailment of the Rabaul inspection to allow time for a rapid inspection (1½ days) of the earthquake damage in the Kokopo area of the Gazelle Peninsula. A preliminary report based on the inspection has been made by Skinner and Denham (1967).

4. DISCUSSIONS

Group discussions were held concerning the Upper Ramu project, and discussions were also held with the Structural Design section of the Commonwealth Department of Works, the Electricity Commission, and the "Earthquake Activity and Risk in the Territory" Committee. These discussions covered the contribution of strong-motion acceleration records to earthquake-resistant design. Also covered were general principles of earthquake-resistant design and some more detailed discussion with groups of those items which particularly concerned them.

5. FACTORS INFLUENCING ENGINEERING SEISMOLOGY PROGRAMME

The extensive tour in the Territory provided a necessary and valuable background to enable me to make recommendations and suggestions with regard to earthquake hazards in this area. In particular I was given a picture of the present size and scope of the economy of the Territory and some indication of the likely lines of development. I was able to see the present methods and scale of construction and form an impression of future trends. The inspection of earthquake damage gave valuable additional information on those types of construction which were present in the epicentral region.

Some of the recommendations arising from this work are included in Section 3 of the report on the Gazelle Peninsula earthquake.

Particular points are expanded below.

6. RECOMMENDATIONS

Installation of two accelerographs at the Upper Ramu project

Two MO2 accelerographs should be installed at the two sites selected in the area of the Upper Ramu project:

- (a) Near the site chosen for the reservoir dam, a little above crest height and a little down-stream from the eastern abutment of the dam.
- (b) A site on steeply sloping rock a little down-stream from the water meter station and at about the same elevation. The accelerograph on this site requires special protection against earth slides.

One accelerograph for the Palm Oil project

The Palm Oil project, Hoskins, should be encouraged to purchase an accelerograph for installation at the site of their oil extraction plant.

Introduction of strong-motion earthquake recorders

A single strong-motion acceleration recorder should be installed centrally in each of the following towns:

Rabaul
Lae
Port Moresby
Goroka
Mount Hagen
Madang
Wewak

In addition three accelerographs should be installed on substantial rock at well separated points; if possible these points should be reasonably near the sites of instruments located near town centres.

These three rock-based instruments, together with those on rock at Kieta, Bougainville and at the Upper Ramu project site, will form a network of five recorders whose records should be related in a relatively simple manner to the earthquake magnitudes and epicentral positions recorded by the Seismological Observatories. The recorders at the major centres of construction will then show how the earthquake attack is modified by local ground conditions. This double network of accelerographs will give the maximum engineering significance to past and future seismological records.

These instrument installations could be spread over two to three years.

Creation of a post in earthquake engineering research

A post should be created for an officer who is primarily responsible for the collection of data related to earthquake-resistant design. He should ensure that these data are processed and reduced to forms suitable for use by structural design engineers.

It should be noted that earthquake engineering is outside the primary interest of seismologists. A special earthquake engineering post or group has therefore been established in many of those countries subject to earthquake damage. Earthquake engineering research would prosper best in an organisation devoted to research and development. However, strong ties should be established with the engineering design offices of the Commonwealth Department of Works and with design offices of the Territories Administration.

For completeness the following recommendations made in the report on the Gazelle Peninsula earthquake are also included.

Introduction of appropriate building code

These defective buildings can be avoided only by the introduction of codes of building practice. These should be as flexible as possible and should emphasise correct use of materials and principles to be followed in design and detailing. Well trained building inspectors should increase the effectiveness and flexibility of code application.

Examination of earthquake damage

A systematic engineering study should be made of the earthquake damage. Steps should be taken to ensure that damage of future severe earthquakes has rapid and systematic engineering assessment.

Earthquake insurance

The possibility of introducing some form of Earthquake damage Insurance should be considered. The New Zealand Earthquake and War Damages Insurance could be examined in this regard. A by-product of insurance claim assessment is an accurate knowledge of the extent and type of damage. Engineering studies are however still required to assess mechanisms of damage.

The above measures should increase greatly the efficiency and economy of earthquake resistant design.

7. APPRECIATION

In conclusion I must express my hearty appreciation to all those who assisted me on the tour and in particular for the excellent staff work of Dr Denham and the detailed technical guidance of Mr Wight who did so much to make the tour fruitful and enjoyable.

8. REFERENCE

SKINNER, H.D. and DENHAM, D.	1967	Preliminary report on the Gazelle Peninsula earthquake of 14th August, 1967, TPNG. <u>Bur. Min. Resour. Aust. Rec.</u> 1967/112
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