ESTIMATING DYNAMIC CHARACTERISTIC OF LOBOU-LOBOU FAULT LINE (SMK KUNDASANG), KUNDASANG SABAH BY MICROTREMOR MEASUREMENTS

INSTITUT PENGURUSAN PENYELIDIKAN
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR
MALAYSIA

BY :

Ir. JAMIL BIN MATARUL
PROF. DR. AZMI IBRAHIM
MOHD AMRAN HASBULLAH

FEB 2012

PEJABAT TIMBALAN PENGARAH
PENYELIDIKAN & JARINGAN INDUSTRI

SARAWAK MALAYSIA

Universiti Teknologi MARA Sarawak
Kampus Kota Samarahan
Jalan Meranek
94300 Kota Samarahan
No. Tel : 082-677200
No. Faks : 082-677300

E-Mel:

Surat Kami : 600-RMU/SSP/DANA 5/2 (15/2010)
Tarikh : 8 Julai 2010

Jamil Bin Matarul
Ketua Projek
Assoc. Prof. Dr. Azmi Ibrahim
Mohd Amran Hasbullah
Ahli Projek
Fakulty of Civil Engineering
UiTM Sarawak
Kampus Samarahan

Tuan

TAJUK PROJEK ESTIMATING DYNAMIC CHARACTERISTICS OF LABOU-LABOU FAULT LINE, KUNDASANG SABAH BY MICROTREMOR MEASUREMENT

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa Jawatankuasa Teknikal RMU Sarawak telah meluluskan cadangan penyelidikan yang telah dikemukakan oleh tuan bertajuk di atas dengan syarat-syarat seperti berikut:

i. Tempoh projek penyelidikan ini ialah 1 tahun, iaitu bermula 16 Julai 2010 hingga 16 Julai 2011.
ii. Kos yang diluluskan ialah sebanyak RM10,000.00 sahaja. Tuan diminta mengemukakan proposal beserta bajet yang baru mengikut kos yang diluluskan sebelum tuan memulakan projek penyelidikan tuan.
iii. Pembelian peralatan computer adalah tidak diluluskan.
iv. Semua pembelian bahan/ peralatan adalah diminta agar tuan mematuhi prosidur perbendaharaan di mana pembelian melebihi RM500.00 hendaklah mengemukakan sebutharga dan borang analisa harga.
v. Pihak tuan dikehendaki mengemukakan laporan prestasi secara ringkas pada bulan Januari 2010 dan Julai 2011 sepanjang penyelidikan tuan berjalan.
vi. Tuan perlu menandatangi Borang Perjanjian Penyelidikan dengan kadar segera kerana penggunaan geran hanya dibenarkan setelah perjanjian ditandatangani. Borang Perjanjian Penyelidikan boleh diperolehi di laman web RMI.
vii. Laporan Akhir perlu dihantar sebaik projek disiapkan dan format menulis laporan akhir boleh diperolehi di laman web RMI.

Sekian dimaklumkan. Terima kasih.

Yang benar

PROFESOR DR. JAMIL HAJI HAMALI
Pengarah Kampus

sk. 1. Prof. Dr. Abu Bakar Majeed
Penolong Naib Canselor (Penyelidikan)
2. Prof. Madya Dr. Rasidah Mahdi
Koordinator RMU, UiTM Samarahan
3. Penolong Bendahari, UiTM Sarawak.

:ni

TABLE OF CONTENTS

ABSTRACT

Kundasang was satisfied as seismic active area due to reactivation of Lobou-lobou fault zone (LFZ) and Mensaban fault zone MFZ [1]. These faults also contributed to widespread ground movements pose the main hazard in Kundasang areas especially SMK Kundasang [5]. Several studies have been conducted to rectify this problem including through letter methods in identifying faults, monitoring and observing geodynamic characteristic of SMK Kundasang [1]; [5]; [52]. However, actual causes of problem due to moderate active seismic area in Central North Zone Sabah are not yet revealed. Therefore, this study tries to reveal the problem based on dynamic characteristics by microtremor measurements. Microtremor measurement such as Ground Ambient Noise (GAN) and Refraction Survey (RS) is a very convenient tool to estimate the effect of surface geology on seismic motion without depending really on other geological information [3]; [34]; [35]; [38]. There are 13 seismic lines GAN measurement were performed and verified with 2 zones of RS after considering critical geodynamic characteristics from previous studies in SMK Kundasang. GAN measurement shown averages site frequency and amplification ratio; 1.32 Hz and 4.64 respectively. Furthermore, critical ground destruction calculated was ranged from 1 to 9E-02 effective strain. According to [53], SMK Kundasang experienced landslide and soil compaction phenomena with dynamic properties of Speed-Effect loading based on effective strain obtained. In another measurement, RS indicate damage /weak zone at average thickness of 3 to 20m with 75m width and V_p was ranged from 700 to 1800 m/s for NW zone. Besides that, SW zone identified damage/weak zone from 4 to 25 m depth with 57 m width and V_p up to 1700 m/s. Finally, both measurements fully agreed with [5] and [54] on damage/weak zone with additional information of stressing damage areas include football field, K5b, K5a, K2d and M2 (S3). However, verification the existence of Lobou-Lobou fault line or Mensaban fault line or its tributaries cannot be identified in study area due to little data measurement and insufficient detail soil investigation data.

CHAPTER 1: INTRODUCTION

1.1 Background

Tectonically, it is clearly stated on themap as illustrated in Figure 2.12 and Figure 2.13. Sabah is situated within the junction between the relatively stable Sundaland (southern edge of Eurasian and northern edge of Indo-Australian plates) as well as western of Pacific and Philippines plates. Particularly, Kundasang area was affected by earthquake, which contribute to widespread and continuous mass movement along the LFZ and MFZ since 1980's. Figure 1.1 below shows the major fault lines (Lobou-Lobou and Mensaban) in Kundasang-Ranau area (JMG, 2006 [1]).

In addition, Malaysia also not really implies the earthquake code design in practising design of building only after Tsunami disaster on 26 December 2004 and moderate felt earthquake events happen in Sabah and Sarawak. For instance, Sabah has experienced over 76 earthquakes since 1897 [1]. Most of the local origins felt the earthquakes are ranges within magnitude of 3.6 to 5.8. Currently, due to destructive earthquake along coastal and localize felt earthquake events, Malaysia has taken initiatives to improve seismic hazard monitoring such as providing more seismic stations, tide gauge networks, buoy networks, coastal camera networks and tsunami sirens (Malaysian Meteorological Department & Ministry of Science, Technology and Innovation, 2010 [2]).

Moreover, due to previous felt earthquake events, there are some observations and monitoring faults have been done by several studies for crucial areas destructives by localize earthquake including observation of geodynamic characteristic and soil behavior such as finding Pinosuk gravel and mass movementsin Kundasang area

In another side, it is well agreed among seismologist that the degree of damage during earthquakes strongly depends on dynamic characteristic of soil as well as