THE EARTHQUAKES EFFECT OF FIXED JACKET PLATFORM DUE TO SURROUNDING EARTHQUAKE IN MALAYSIA

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A thesis in fulfillment of the requirement
for the award of the degree
of Bachelor of Civil Engineering

Faculty of Civil Engineering and Earth Resources

UNIVERSITI MALAYSIA PAHANG

JUNE 2016

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LIST OF SYMBOLS

mm	Millimeter
N/mm^2	Newton per millimeter square
Kg	Kilogram
N	Newton
kN	Kilo Newton
kN/m^2	Kilo Newton per meter square
sec	Second
kNm	Kilo newton meter

LIST OF ABBREVIATIONS

BS	British Standard
EN	European Standards
M_w	Moment Magnitude Scale
API	American Petroleum Institute
E	Young Modulus
DD	Dead Load
LL	Live Load
EL	Environmental Load
TH	Time History
V_{ED}	Maximum design shear force
$V_{c,Rd}$	Shear Resistance
σ_s	Shear stress
$\sigma_{all,s}$	Allowable shear stress
σ_b	Bending stress
$\sigma_{all,b}$	Allowable bending stress
M_{ed}	Maximum external design moment
M_{rd}	Moment resistance

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ABSTRACT

The suddenness of earthquake that comes without warning seems to bring along unavoidable death, property damage and alter the socioeconomic functioning of the communities involved. Earthquake has caused the destructive of countless city and villages. This nature's greatest hazards lead to thousands of people were lost their life, living homeless, thus results on adversely impact of country's economy. The totally unexpected devastation that produces from earthquake may effect on failure of civil engineering structures. The command type of failure usually related on collapse of buildings, bridges, dams, as well as offshore facilities like fixed jacket platform and other structure. Basically almost all civil structure in Malaysia is design without considering effect from earthquake. Moreover, the event of abrupt energy drive within the Earth's layer which generates seismic waves, which is, will be able to reach pick state enough to extinguish massive structures in additional eradicate countless of lives. The objective of this paper are to study the behavior of fixed jacket platform that subjected to earthquake excitation., to determine the best mode shape of vibration analysis and to determine performance of fixed offshore platform structure under earthquake of determined data location.

ABSTRAK

Gempa bumi yang datangnya tanpa amaran dan membawa kepada kematian yang tidak dapat dielakkan, kerosakan harta benda dan mengubah fungsi sosioekonomi komuniti yang terlibat. Gempa Bumi telah menyebabkan merosakkan bandar dan kampung-kampung yang tidak terkira banyaknya. Bencana terbasar ni telah menyebabkan beribu manusia kehilangan nyawa, tempat tinggal dan kesan daribada bencana ini juga telah menyebabkan kemerosotan ekonomi sesebuah Negara itu. Kemusnahan yang tidak dapat dijangka ini juga menyebabkan kegagalan struktur kejuruteraan awam. Jenis perintah kegagalan biasanya berkaitan pada keruntuhan bangunan, jambatan, empangan, dan juga kemudahan luar pesisir seperti platform jaket tetap dan struktur lain. Pada dasarnya hampir semua struktur awam di Malaysia mempunyai reka bentuk tanpa mengambil kira kesan daripada gempa bumi. Tambahan lagi, kejadian daya tenaga yang mendadak dalam lapisan Bumi yang menghasilkan gelombang seismik, yang mampu mencapai kadar maksima yang cukup untuk memadamkan struktur besar-besaran dan mampu membunuh banyak nyawa. Objektif kertas kerja ini adalah untuk mengkaji tingkah laku struktur platform luar pesisir tetap yang dikenakan pengujaan gempa bumi, untuk menentukan mod bentuk yang terbaik dalam analisis getaran dan untuk menentukan prestasi struktur platform luar pesisir yang tetap di bawah gempa bumi lokasi data yang telah ditetapkan.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The suddenness of earthquake that comes without warning seems to bring along unavoidable death, property damage and alter the socioeconomic functioning of the communities involved. Earthquake has caused the destructive of countless city and villages. This nature's greatest hazards lead to thousands of people were lost their life, living homeless, thus results on adversely impact of country's economy. The totally unexpected devastation that produces from earthquake may effect on failure of civil engineering structures. The command type of failure usually related on collapse of buildings, bridges, dams, as well as offshore facilities like fixed jacket platform and other structure. Moreover, basically almost all civil structure in Malaysia is design without considering effect from earthquake.

In general, impact of the earthquake led to the phenomenon of ground failure, indirect effects and ground shaking. Ground failures commonly related to surface faulting, ground cracking, ground subsidence and landslide. The generating of earthquake is cause by 2 side of faults slip to one another. It is called surface faulting. The structure will be affected, damage, if it is lies across the surface fault. Soil that looses its support is tent to settle and directly being transported to a different location, called ground cracking. Other than that, earthquake will generate vibratory effect, results, the compaction of soil affecting the structure and settlement as well. This is ground subsidence phenomenon. Usually it occurs on loose and compressible soil but eventually ground subsidence phenomenon is not

giving more impact/failure to the structure. The soil will experience landslide if they are triggered by a strong earthquakes. The soil that originally stable will endure until its reach one ultimate point which is cause by shaking that generate by an earthquake and led to

experience slope failure. The structure may damage by the landslide if the structure is located on top of that soil. (Roberto Villaverde, 2009).

Therefore, with consistent and effective application of scientific and engineering principles and technique, at least the failure that cause by earthquake can be minimized.

1.2 PROBLEM STATEMENT

Generally Malaysia is not lies on the fault area of seismic zone and located at stable Sunda plate, but lately pressure on the continent is intensifying because the Australian, Eurasian and Philippine plates around us are moving and pushing into us. This phenomenon led to crack occur on the surface of the soil results on the relieve stress from the earthquake force (Professor Dr. Azlan Adnan, 2012). On 5th of June 2015, Malaysian was shocked with a moment magnitude of 6.0 which lasted for 30 seconds of earthquake phenomenon occur at 14km from Ranau, Sabah. At least 18 people were killed, some injured, some hostels and rest houses damaged seriously and rock falls triggered on Gunung Kinabalu. About 23 schools and some other buildings damaged, water supply disrupted and discolored in the Kundasang-Ranau area. Felt (VI) at Kinarut and Ranau; (V) at Kota Belud; (IV) at Donggohgon, Kota Kinabalu, Kudat, Papar and Putatan; (II) at Beaufort. Also felt at Kapit, Keningau, Miri and Sandakan. Felt at Tarakan, Indonesia and at Bandar Seri Begawan and Bangar, Brunei. *("M6.0 - 12km WNW of Ranau, Malaysia". United States Geological Survey. 5 June 2015)*