

Geotechnical Properties of the Quaternary Calcareous marine terraces of the Qeshm island

P. Rezaee

Geology Department, Hormozgan University
peiman_rezaie@yahoo.com

A.R. Rasekhi

Civil Engineering Department, Islamic Azad University, Qeshm Branch

Abstract

The Qeshm island with a maximum of 1796 km² is located at the Persian gulf, near the Hormoz strait. It is located at the southeast of the Zagros sedimentary structural unit. Varied deposits with Upper Precambrian to Quaternary age have outcrops at the island's surface. The Quaternary calcareous marine terraces are located from bank until latitude of 220m in different parts of the Qeshm island. These deposits are composed from types of limestone. Geotechnical experiments achieved on 180 samples from 30 holes drilled on these deposits. The most important results are: porosity: %10.7-20.2, Loss of weight: %0-3, Percentage of abrasion (Los Angeles method): %49-100, Percentage of water absorption: %2.4-26, Dry compressive strength: 21-87 kg/cm², Moisture compressive strength: 4-50 kg/cm², Index of R.Q.D: %23-69, Index of CR: %43-95, Vertical Force: 3-6 kN, Vertical stress: 1.04-2.09 MPa, Dry density: 1.25-2.15 gr/cm³, Apparent specific gravity: 2.118-2.359 kN/m³, True specific gravity: 1.790-2.107 kN/m³, Effective shear stress: a) ultimate: 0.35-0.87 MPa, b) residual: 0-0.7 MPa, Resistivity coefficients: a) ultimate: $C_u = 0-0.82$ kg/cm², ϕ_u : 0-23°, b) residual: C_r : 1.2 kg/cm², ϕ_r : 0-19°. These information show that the deposits have low to moderate strength and are moderate dense. These geotechnical properties are caused until civil applications of these rocks in the Qeshm island are very different, but must be precaution.

Introduction

In the Qeshm island, there are 28 calcareous marine terraces of the Quaternary age. These rocks have abundant applies in civil activities on the area. So, to recognize of geotechnical properties of these deposits is very important. This affair, is the subject of under paper.

Discussion

1- Geographic characters:

The Qeshm island with 1536 - 1796 km² area (in view of maximum and minimum of tide, and area of the Harra forest), is located at the Persian gulf and near the Hormoz strait. This island has below geographic coordinates: 55° 20'-56° 44' eastern longitudes and 26° 5'-27° 10' northern latitudes. The Namakdon crest with 397m height is the most raised point of the Qeshm island. From the most important geographic properties of this island, can be direct to below cases: moisture and warm climate, height of waves 1-5m, sea level changes (during of tide) 0.2-4.3m, mean of year temperature 27°C (22-50°C), average of year precipitation 175mm [1].

2- Geological properties

The Qeshm island is located at the extreme southeast of the Zagros sedimentary-structural unit and is a part of the folded Zagros and Bandar Abbas subzone. Various deposits with Upper Precambrian to Quaternary age have profiles at the island surface. Hormoz series (Late Precambrian-Early Cambrian) which consists of salt rock, gypsum and parts of limestone, dolostone, sandstone, and igneous rocks. Mishan formation (Middle-Late Miocene) that compose from limestone and marl. Aghajari formation (Late Miocene-Pliocene) which consists of sandstone, marl and siltstone. Bakhtiari formation equivalent deposits that compose of loose conglomerate, marl and siltstone. Quaternary deposits of the Qeshm island are very different: marine terraces, alluvial sediments, coastal and eolian sands, evaporite/mud sediments, fine grain recent deposits [2]. The important geological structures of this island, have east-west or east-north-west-north strike. Relatively danger of earthquake in the area is high and minimum of base design acceleration is 0.35g[3].

3- Quaternary calcareous marine terraces

The age of this deposits is Pleistocene to Holocene. There are 28 Quaternary calcareous marine terraces in the Qeshm island from near of beach to 220m height [2]. They overlay older deposits with a erosional unconformity. These deposits have a low dip to sea, relatively flat shape, and 10m maximum thickness. They place especially near and along coasts of this island. These terraces are composed from fine to coarse grain limestones and are rich from bioclasts, example: bivalve, coral, red algae, echinoderm and bryozoae until 70%. These rocks that are named Loumashel commonly, settle at classes of mudstone, bioclast wackstone, bioclast packstone and rudstone. They have very low quartz, feldspar and iron oxides.

4- Geotechnical properties of Quaternary calcareous marine terraces

For study of these characters, 30 hole drilled in the terraces at places how Suza, Basaidu, Dulab, Mesen, extreme east of the Qeshm island and 180 samples took from these deposits. The different geotechnical field and laboratory tests on these holes and samples, show that the Quaternary calcareous marine terraces have below properties: 1-RQD (rock quality designation) index: %23-69.2-CD (recovery percentage) index: %43-95.3 Vertical force (P_n): 3-6 kN, 4-Vertical stress (σ_v): 1.04-2.09 MPa, 5-Dry density: 1.25-2.15 gr/cm^3 , 6- porosity (n): %10.7-20.2, 7-Loss of weight: % 0-3.8-Percentage of abrasion (Los Angeles method): %49-100, 9-Percentage of water absorption: %2.4-26, 10-Dry compressive strength 21-87 kg/cm^2 , 11-Moisture compressive strength: 4-50 kg/cm^2 , 12-Apparent specific gravity: 2.118-2.359 kN/m^2 , 13-True specific gravity: 1.790-2.107 kN/m^2 , 14-Effective shear stress: a) ultimate: 0.35-0.87 MPa, b) residual: 0-0.7 MPa, 15-Resistivity coefficients: a) ultimate: C_u : 0-0.82 kg/cm^2 , ϕ_u : 0-23°, b) residual: C_r : 0-1.2 kg/cm^2 , ϕ_r : 0-19°.

Conclusion

The experimental information and correlated them with geotechnical references about these, show that the Quaternary calcareous marine terraces have low to moderate strength and are moderately dense. These rocks are suitable and have very applies in make of small wave breakers, coastal walls and revetments (especially in the north coasts), borrow materials (for

different structures such as roads, barriers and ...) and pure lime in the Qeshm. Of course, these applications must be precaution.

References

- [1] AMRI KAZEMI, A.R, The geological atlas of Qeshm island, GSI (2005), 113p.
- [2] HAGHIPOUR, A, Geology of the Qeshm area, Qeshm free area (2005), 5p.
- [3] VISEH, S., KHODABANDEH, N., Exploration and quality appointment of Qeshm island's local materials, House and building institute (2003), 156p.
- [4] HAGHIPOUR, A, Geological researches and mining explorations of Qeshm area, Ministry of metals and mines (1995), 523p.