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Subject 2- Geotechnical Engineering

I.D 1- 7834

Section 2- B

Module 1- 6th

Assignment 2- 01

Q no 1 Write a geotechnical report of any civil engineering project which is close to your hometown.

Ans This is the geotechnical report of BOQ in Peshawar Cantt.

Introduction

This report is carried out for geotechnical investigation of boundary wall BOQ in Peshawar cantt. The purpose of this investigation was to evaluate the subsurface conditions on the site into the area of the proposed building and to provide geotechnical bearing capacity and recommendation for the construction.

Project Description

The 2331 Kanal property is located in a under developed region of BOQ Peshawar cantt. The project will include construction of a new boundary wall occupying the entire property.

Geologic overview :-

The project site is located in the ~~bank~~ Peshawar road near cantt.

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It is an alluvial plain of 3000km^2 and its catchment extent Khaibar Sang, Hindi Kush range. The mountain bordering the alluvial plain are mostly composed of late tertiary age Hood; assumed that these rock extent as basement rock sciwalik group. During the upper pleistocene and holocene the basin has been filled with silty clay, sand and gravels.

Seismicity

⇒ This construction site belongs to seismic zone 3A with peak horizontal acceleration varying from 0.07 to $0.14g$.

Subsurface

Five exploratory borings and three pits were excavated in the area of the proposed boundary wall. In general, our exploratory borings encountered predominantly silt upto 6ft depth and after clayey soil upto 22ft depth.

Laboratory test

Unconfined compression tests, Direct shear test and consolidation test were performed on undisturbed soil specimens obtained from boreholes and test pits using Shelby tube and block sampler. Additionally Atterberg limit test, sieve analysis, moisture content tests were conducted on disturbed samples for classification purpose.

Groundwater

ground seepage water table was encountered in borehole No 3 and 4 at 11ft depth from ground level.

Conclusion and Recommendations

Keeping in view results of the field and lab tests, it is concluded that bearing capacity of 0.60 TSF may be adopted for strip foundation at 6th depth for the construction of boundary wall BOQ peshawar cantt.

⇒ ~~Since~~ Since the shrinkage value of foundation lies between 30-37, which shows soil class of very poor quality. It is recommended to replace the foundation soil with well graded gravel and properly

compact it.

- ⇒ There is no risk of chemical attack on concrete as the chemical content of soil is in permissible range
- ⇒ In case of masonry wall provide RCC column at 10ft interval and strap beam at the top of foundation RCC slab to reduce differential settlement

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Quiz :- 1

Q1) Write a note on different software which are used in geotechnical engineering.

Ans) Following are the different softwares used in geotechnical engineering.

1) 3 Deep Virtual Reality Software for Deep Excavations

This is the first software fully integrated with a design software package for automatic model generation. For the first time, you can easily demonstrate to your clients what your work is all about before putting a single shovel in the ground.

- ⇒ Unlimited walls and number of excavations
- ⇒ Multiple stages in same model.
- ⇒ Single button integration from Deep 2008
- ⇒ Multiple support types
- ⇒ View walls and footings
- ⇒ Multiple well types

2) ALP - LATERAL-Loaded Piles Analysis Software

ALP enables you to analyze laterally loaded piles with ease, producing outputs such as comparison graphs in mins. The software predicts the pressure, Horizontal moments, shear forces and bending moment

(2)

included in a pile when subjected to lateral load, bending moments and imposed soil displacements. lateral load and bending moments can be applied at any point down the pile as well as partial or full, lateral or bending moment restraints.

3) AmRetain software

:- It is a software for checking single or double retaining walls made of Accelor Mittal, sheet piles, It has been developed by Ferrasol for Accelor Mittal and is based on commercial software K-Rea.

→ AMRetain calculation is based on the "subgrade reaction calculation method" but also includes 3 checks according to the french standard NF P94-282.

- (i) Failure on the passive side
- (ii) Balance of vertical forces
- (iii) K_{sc}

It also enables the calculation of double walls and near walls.

RESULTS:

TERZAGHI & SPT Value Based

S.No	Reference/ Marking	Bulk density (Pcf)	M.C (%)	L.L (%)	P.L (%)	Classification of soil (Depth of 4ft).	Safe Bearing Capacity (TSF) Terzaghi & SPT	
1	B.H 1	106.5	11.2	23.7	20.9	ML	0.44	0.8
2	B.H 2	105.8	10.5	23.5	20.7	ML	0.49	1.0
3	B.H 3	103.7	11.6	24.9	19.4	ML	0.47	0.5
4	B.H 4	104.1	8.5	24.9	21.4	ML	0.43	0.42
5	B.H 5	105.3	12.5	22.5	20.0	ML	0.45	0.33

BH / TP ID	BH-1	BH-2	BH-3	BH-4	BH-5	TP-1	TP-2	TP-3
$W_1 =$ Wt of core cutter + soil (lbs)	1.949	1.945	1.894	1.927	1.916	0.485	0.478	0.481
$W_2 =$ Wt of core cutter (lbs)	0.969	0.971	0.941	0.969	0.947	0.185	0.185	0.185
$W_3 =$ Wt soil ($W_1 - W_2$) (lbs)	0.980	0.974	0.954	0.958	0.969	0.299	0.293	0.295
Vol of core cutter (cf)	0.0092	0.0092	0.0092	0.0092	0.0092	0.0028	0.0028	0.0028
Density = W_3 / Vol (lbs/cf)	106.5	105.8	103.7	104.1	105.3	106.7	104.6	105.4

FIELD DENSITY TEST

BH ID	BH-1	BH-2	BH-3	BH-4	BH-5
$W_1 =$ Wt of wet soil + cont (g)	37.91	47.00	33.20	42.19	27.60
$W_2 =$ Wt of dry soil + cont (g)	35.20	43.70	31.10	39.00	25.90
$W_3 =$ Wt of container (g)	11.10	12.30	13.00	1.40	12.30
$W_w =$ Wt of water ($W_1 - W_2$) (g)	2.71	3.30	2.10	3.19	1.70
$W_s =$ Wt of dry soil ($W_2 - W_3$) (g)	24.10	31.40	18.10	37.60	13.60
$C = W_w / W_s \times 100(\%)$	11.2	10.5	11.6	8.5	12.5

NATURAL MOISTURE CONTENT

BH/TP ID	TP-1	TP-2	BH-02
Shrinkage Limit	20.8	23.23	27.175
Shrinkage Ratio	1.8	2.0	1.6

SHRINKAGE LIMIT

Borehole ID	Material	Soil Compressibility				
		Compression Index (C_c)	Swell Index (C_s)	Coefficient of secondary compression (C_α)	Recompression Index (C_r)	Coefficient of Consolidation (C_v) (cm^2/sec)
BH-01	Silt	0.256	0.0501	0.052	0.05	0.669
BH-01	Clay	0.153	0.255	0.03	0.0255	0.0022

CONSOLIDATION TEST