LECTURE NOTE

ON

GEOTECHNICAL ENGINEERING (TH.2)

3RD SEMESTER IN CIVIL ENGG.



PREPARED BY

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G.I.E.T

(POLYTECHNIC), JAGATPUR, CUTTACK, ODISHA

TST Chopter MANNEN WENNALD JEANN TANK Def of soil.

Soil is defined as an unconsolidated. material, composed of solid particles, produced by the disintegration of rocks.

Soil Engineering

Soil Engineering deals with oll engineering Problems related with soils. It includes Site investigations, design and construction of foundations, earch, retaining structures and earth structures into 1912 House Birds

Scope of soil mechanics assured adapt Soil mechanics has vost application in the Construction of vorvious civil Engineering MowN - - Mar-ohi worycs.

1 5-Shollow foundation , - Pile foundation Ex , Foundation

2- Retaining structures 3- stability of slopes a-filling, b-cutting 4 - Underground Structures

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SMURSY

a-Tunnel b-conduit

5- povement design

6 - Earth dam WO466 7 - Miscellaneous soil problems EX shrunkage, swelling of soils

of water

Volume hat all the

at Walking of Schiefs to

A Diov 25 dr. unsv

THREE PITASE DIAGRAM (2nd chopter) Word SANC Air Airi Vo 1 Woter Noten Mh VW *MVY /solids solids MS v_{c} 19 WY 14 A soil moss is a three Phose system consisting of Vat Vw VV = solid Porticles, water and air. The void space between the soil grains is filled Portly with water and paretly with oir X 25 Montoone lies T Mo=0 Air Va MW M Noter solids ٧s 173 hauss Wato Ain Va 个 woten VW $\sqrt{\sqrt{}}$ solids Ws. Vs where, volume of woten Vw= Va = volume of airc Vv = volume of void volume of solids Vs =

V= TOTAL VOIUME & LOS LONGE ST 18 Ma = Mass of oir not 01 and Mw = moss of woten wi Ms = Mass of solids when at 2000 sit M= 1 grafini, 100 280M mpotot = M Wa = Weight of oirs= 0 vivong sidiogra Ww = Weight of woter Ws = Weight of solid's 2015 = 1102 W = Total weight) OHAST 610V At 10 Ditosi shit, 20 as benings 21, the inte Water content (w) ant of 26 The woter content (w) is defined of the rotio of the moss of water to the mass of solids W = MW WWO decimos 130 States 25 MsWa 205709 the volume > The woter content is of source of the A SHI'S expressed of a percentage. pensity (P) otas 2 no 9 Density is defined as the ratio of moss to not volume. and of the soil. Density is defined of the moss OR P= M of the soil Per unit volume specific gravity (G) The specific grovity of solid Porticles (6) is defined of the Ratio of the moss of a given volume of solids to the moss of on equal VOIUME OF water of yo'c.

97 is denoted of gradies hotor
G = <u>Ps</u> or G = <u>Vs</u> <u>The moss density of wooten Pw of y°c</u>
The mass looping of god for but of y'c
= 1 gm/m1, 1000 kg/m3, 1 mg/m3
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Specific grovity of solids for notored
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Dt is expressed, os pencentoge. $\frac{1}{n} = \frac{V}{V_{v}} = \frac{Vv + Vs}{Vv}$ $\frac{1}{n} = 1 + \frac{1}{2} = \frac{1+e}{e}$

Rod 1001 when the sail is fully sateria which I-D cited & Rothics in the Angle At Stands Percentage of air Voids (no) samples prin earloss of is the reatio of the volume of aire to the total volume and all no= Va W. H. W. C. Byld 9t is represented of percentage. the wet mays, deals but 140 Air confent Cacje . rtieneb no vaizasto Air content is depined on the notio of the volume of one to the volume of voids ?! of vtilago 220m vars Shir 0-5 tet Varia presentes of saids performent to Smold V Stis expressed as a pencentage. when soil is soturated Va=0 $D_{\alpha} = \frac{V_{\alpha}}{V} = \frac{V_{\alpha}}{V_{V}} \times \frac{V_{V}}{(e^{T_{\alpha}})} \times \frac{V_{\alpha}}{(e^{T_{\alpha}})} \times \frac{V_{\alpha}}{(e^$ Thus no = noct kalon kulansk month som こうしんないり、ション、マリションが見て、うい 2250 ED H Degree of soturation Cstate 20051920 of The degree of solurion (s) is the rotio of the volume of woten to the Volumes of voids ? rensed by site 101 Yinz 214 20 05+05 Rooter cond 148 political Very Si Fr to the directioner bet of 73 220 St. RAPIOS / MP + ME ADOS Q The degree of soluration is generally expressed as a pencentage. Stis equal to zero when the soil is obsolutely drug

And 100% when the soil is fully soturated. The degree of soturation is expressed of sh Bulk moss density (P)

The bulk moss density (B) is defined of the total mass (M) per unit total Volumery

P = M

The bulk moss density is olso known os the wet mass density or simply build density on density. It is expressed 01m3, cg/m3, lgm/m), on Mg/m3 DRY Moss density (Pa) to small and

The dry mass density for is defined. OS the mass of solids per unit total VOLUME

Stis expressed os an Egginate The drug moss density is also known as the dry density.

Density Index (ID) VV

The term density index ID or relative density or degree of density is used to express a the relative compactness OF a solution soil deposit. The density index is defined as the rotio of the difference between the voids ratio of the soil in its loosest state Rmax and its notural voids ratio'e' to the difference between the voids Ratios in the loosest and densest Stote all and an tage of sangets san

I I I C max - e emax - emin

where - < 2-0M emox = voids ratio in the loosest stole emin = voids notio in the densest store e = Notural voids reatio of the depo when a stift. > when the notural state of the cohesionless soil is in its loosest form e= emox and hence ID= Oot od Anthe notorial depositions in its densest state e=emin & hence ID=1 > Any intermediate State the density index varies between zero s and one ongos 55 WINTER STOLM, STOTOM JC Bulk density(P) The buik density on moist density is the total moss M of the soil persunit of of its total volume TINC _ Its equiper to P=M gt is expressed in terms not g/cm³ on 1cg/m3 Soturated density (Psot) n2 3 F. LAS When the soil moss is saturated Its bulk density is colled solurated density. Thus the saturated deality is the rotio of the total soil moss of Soturoted somple to its total volume. Drey density (Pd) ability and the dry density is the mass of solids Per unit of total volume of the soil mass Pd = Md submerged density (P) in Music the submerged density is the

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Submerged moss of soil solids (Md) sub per unit of total volume vor the soil