BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY



Course No: CE 452

Course Title: Transportation Engineering Sessional- I

Assignment Name : California Bearing Ratio (CBR) Test.

Submitted to : Dr. M. Neaz Murshed
Assistant Professor, CE Dept., BUET
Dr. Annesha Enam
Assistant Professor, CE Dept., BUET

Submitted By :

Name : Shantanu Paul
Student ID : 1604047
Section : A(2)
Group : 8

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Group No.	No. of Blows	Wt. of mold+ base plate (gm)	Wt. of compacted sample+ mold+base plate (gm)	Wt. of compacted sample (gm)	Wt. of compacted sample (lb)	Wet Density (pcf)	Wt. of Can (gm)	Wt. of Can+ Wet Sample (gm)	Wt. of Can+ Dry Sample (gm)	Moisture Content (%)	Dry Density (pcf)
1,4	10	7550	11823	4273	9.42	125.6	28	184	169	10.64	113.52
2,5	25	7550	11997	4447	9.80	130.67	28	190	174	10.96	117.76
3,6	56	7550	12259	4709	10.38	138.4	28	194	178	10.67	125.06

Group No.	Penetration Dial Reading										Soaking		Swelling (%)
	63.5	127	190.5	254	317.5	381	444.5	508	635	758	Dial Reading		
	0.025"	0.05"	0.075"	0.1"	0.125"	0.15"	0.175"	0.2"	0.25"	0.3"	Initial	Final	
1,4	17	38	67	98	126	150	172	190	223	238	128	140	0.103
2,5	20	41	70	101	129	154	176	195	228	244	132	145	0.112
3,6	23	44	73	104	132	158	180	200	233	250	133	146	0.112

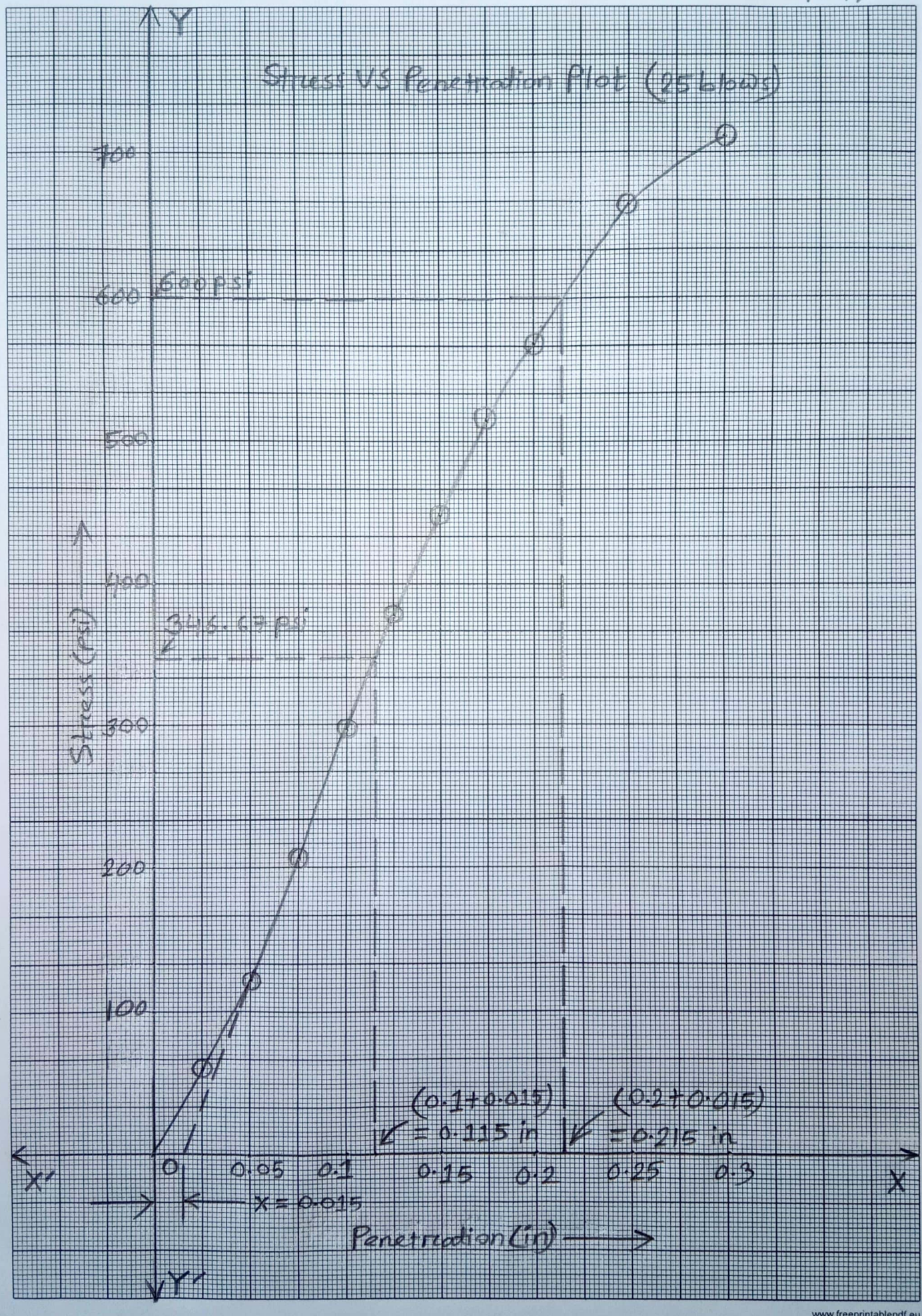
Group No.	Load Values (lb)									
1,4	153.228	336.444	589.458	859.92	1104.21	1313.6	1505.54	1662.58	1950.5	2081.36
2,5	179.401	362.618	615.631	886.094	1130.38	1348.5	1540.44	1706.21	1994.12	2133.71
3,6	205.575	388.792	641.805	912.268	1156.56	1383.4	1575.34	1749.83	2037.74	2186.06

Group No.	Stress Values (psi)									
1,4	51.076	112.148	196.486	286.64	368.07	437.866	501.847	554.194	650.165	693.788
2,5	59.8	120.873	205.21	295.365	376.794	449.499	513.48	568.735	664.706	711.237
3,6	68.525	129.597	213.935	304.089	385.519	461.132	525.112	583.276	679.247	728.686

Table: CBR Test Datasheet.

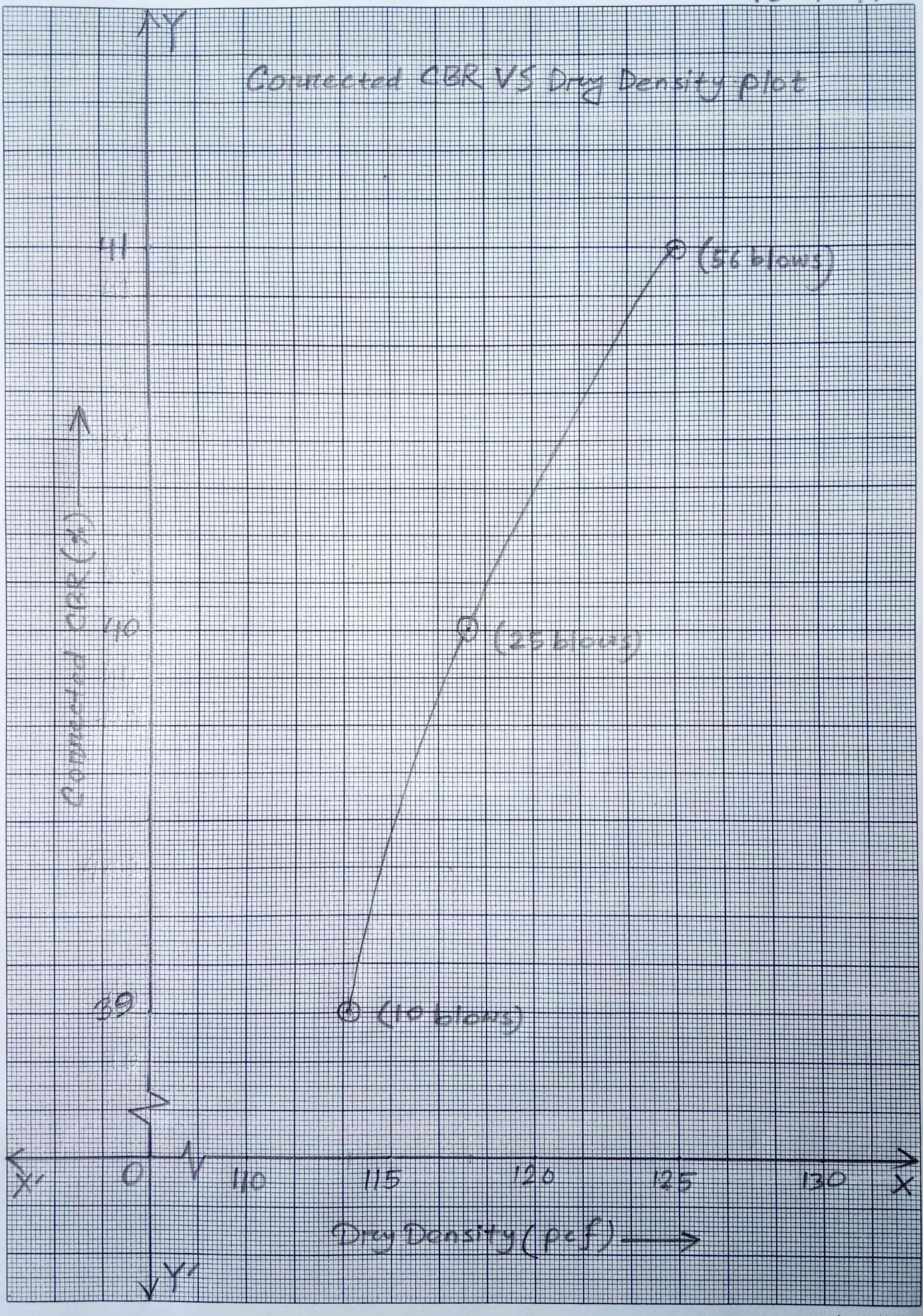
Volume of the compacted sample=0.075 cft
Area of the Plunger = 3 in^2
Calibration of the Proving Ring, y (lb)=8.7246x+4.9094
Penetration Dial Constant= 0.01mm & Soaking Dial Constant= 0.01mm

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Sample Calculation:

Weight of compacted sample =

(Weight of compacted sample + mold + base plate) −

(weight of mold + base plate)

$= 11997 - 7550 = 4447\ gm = 9.80\ lb$

Wet Density, γ_b = (Wt. of compacted sample / Volume of compacted Sample)

$= 9.80 / 0.075$

$= 130.67\ pcf$

$$\text{Moisture content} = \frac{(\text{wt. of can + wet sample}) - (\text{wt. of can + dry sample})}{(\text{wt. of can + dry sample}) - (\text{wt. of can})} \times 100$$

$$= \frac{190 - 174}{174 - 28} \times 100$$

$= 10.96\ \%$

Dry Density, γ_d = Wet density / (1 + Moisture content / 100)

$= 130.67 / (1 + 10.96/100)$

$= 117.76\ pcf$

Penetration value = penetration dial reading × Penetration dial constant

$= 63.5 \times 0.01$

$= 0.635\ mm$

$= 0.025''$

Calibration of the proving Ring, $y(lb) = 8.7246x + 4.9094$

Load dial reading, $x = 20$ (when penetration $= 0.025''$)

Load, $y = 8.7246 \times 20 + 4.9094 = 179.401$ lb

Area of the plunger, $A = 3$ in^2

Therefore, Stress $= y/A = 179.401/3 = 59.8$ psi

Swelling = (Final soaking dial reading − Initial soaking dial reading) × Soaking dial constant / Height of specimen × 100

$$= \frac{(145-132) \times 0.01}{(7-2.416) \times 25.4} \times 100$$

$= 0.112\%$

[Here, Height of specimen
= Height of mold − Height of spacer disk
$= (7-2.416)'' = 4.584''$]

From Stress Vs penetration plot,

Adjusted zero point $= x =$ 0.015 in

Now, stress at $(0.1 + 0.015) = 0.115$ in, $\sigma_{0.115} = 346.67$ psi

and stress at $(0.2 + 0.015) = 0.215$ in, $\sigma_{0.215} = 600$ psi

$$\text{CBR at } 0.1'' = \frac{\text{Connected stress value at } 0.1'' \text{ penetration}}{\text{Standard stress, } 1000 \text{ psi}} \times 100$$

$$= \frac{346.67}{1000} \times 100 = 34.67\% \simeq 35\%$$

$$\text{CBR at } 0.2'' = \frac{\text{Connected stress value at } 0.2'' \text{ penetration}}{\text{Standard stress, } 1500 \text{ psi}} \times 100$$

CBR at 0.2" = $\frac{600}{1500} \times 100$ = 40%

Here, CBR at 0.2" > CBR at 0.1", therefore, the test should be repeated. But the other tests conducted at 10 and 56 blows also give similar result.

Hence, CBR (%) = CBR at 0.2" penetration = 40%

Result:

CBR (at 0.2") for 25 blows = 40% (Dry density = 117.76 pcf)

Swelling = 0.112%

For corrected CBR vs dry density plot,

Group No.	No. of Blows	Maximum Dry Density (pcf)	Corrected CBR (%)
1, 4	10	113.52	39
2, 5	25	117.76	40
3, 6	56	125.06	41